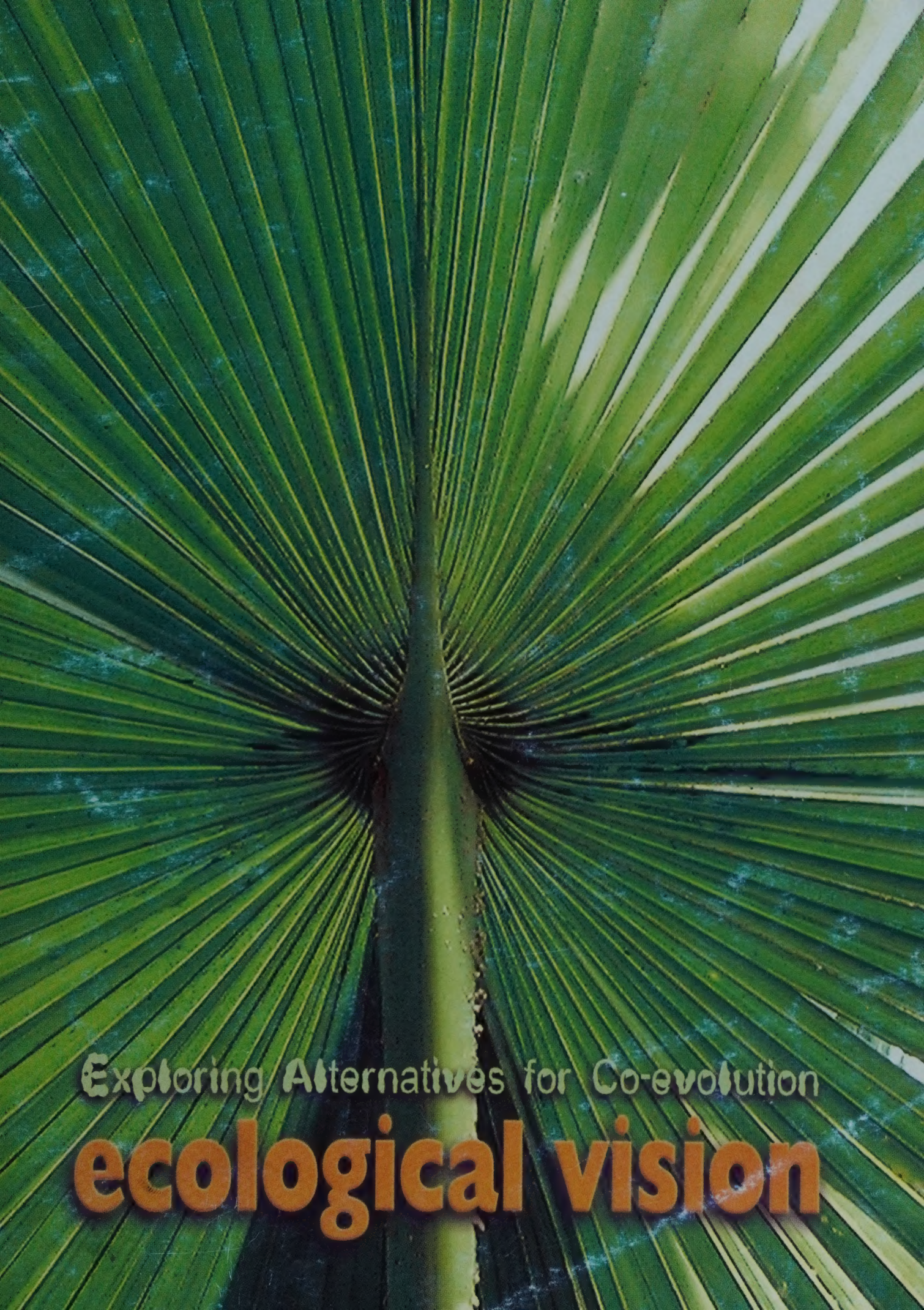
Exploring Alternatives for Co-evolution
ecological vision

Pallavi
- Dec 2018

Dedicated to the children and those yet to come, with the hope that our generation leaves behind a decent chance for their well-being...

Ecological Visions

Exploring Alternatives for Co-evolution

ecological visions

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Revised Edition of Ecological Visions: Some Comments...

The idea of reprinting Ecological Visions: Exploring Alternatives for Co-evolution (1989) started with the requisition from readers. We allowed the idea to mature with the insight that history offers about the relationship of people with environment. It is about the constant demand on our creativity in addressing our present context by shedding limitations of our past behaviours. Ecological Visions: Education for Co-evolution has been reprinted not because it would speak the story of our glorious past but in an attempt to understand the seriousness of the responsibility of a generation exploring alternative ways in meeting their present—a generation which tried to feel as if it was the last one with still the possibility of bringing about changes everywhere and in everything.

We have tried to complement the environmental issues discussed in Ecological Visions with new forms they have taken now. This complementarity has been again from published works we had chances to read.

The Global Methodology for Mapping Human Impacts on the Biosphere (GLOBIO) of United Nations Environment Programme confirms the threat to the arctic region because of the rapid industrialization (Down to Earth, July 15th 2001) which was again the theme of the Green Peace Intervention (Mirror, June 1989).

Indoor Air Pollution—The 'Unseen' Devil (Toxics Link Information, August 2001, no.14) is the new form the Gas-Chamber city has taken. It is a discussion on how the components used to beautify our homes can emit pollutants affecting especially children and elderly, spending considerable time indoors. This is again the focus of the news from Times of India (4th May 2002) with deodorants and anti-perspirants being claimed as fragrance of ill-health by the Consumer Magazine (Vol. 21 (1), Jan.-Feb. 2001). A news-item in Down to Earth (July 15th 2001) predicts a new finding on the Gas-Chamber city: increase in the likelihood of heart-attack with exposure to elevated levels of fine particles from automobiles for just 2 hours.

'Poison in Your Food' because of fertilizers, pesticides, insecticides can be addressed by healthier, tastier and costlier organic food available in the domestic market through Khadi Village Industries Corporation according to Sharmistha Choudhury of Telegraph (6.05.2002). This is one way to resolve the ambiguities in the test of safety of Genetically Modified food items (Telegraph 27.02.2002).

The City Waste in the third-world have taken new dimensions with the workers there using 19th century technologies to clean up the wastes from the 21st century electronic technology (mainly obsolete computers) (Times of India 27.02.2002). Campaign for Extended Producer Responsibility for post-consumer e-waste (to make manufacturers financially responsible for the obsolete e-products) by Silicon Valley Toxics Coalition is a new environmentally conscious network (Toxic Link No.13, Oct. 2001).

Another alternative to deforestation and fuel crisis is recorded (in Down to Earth, July 15th 2001) with the changes brought about with the sharing of cost for solar light installation and digging of ponds for water harvesting in an adivasi village in Kerala.

Discussion on ethics and ecology for creating alternative futures is explored in the context of research on cancer (Hindusthan Times, 11.09.2000). Anil Agarwal's hypothesis: if cancer is the result of pollution then not only the way of looking at cancer but that of pollution would also have to change.

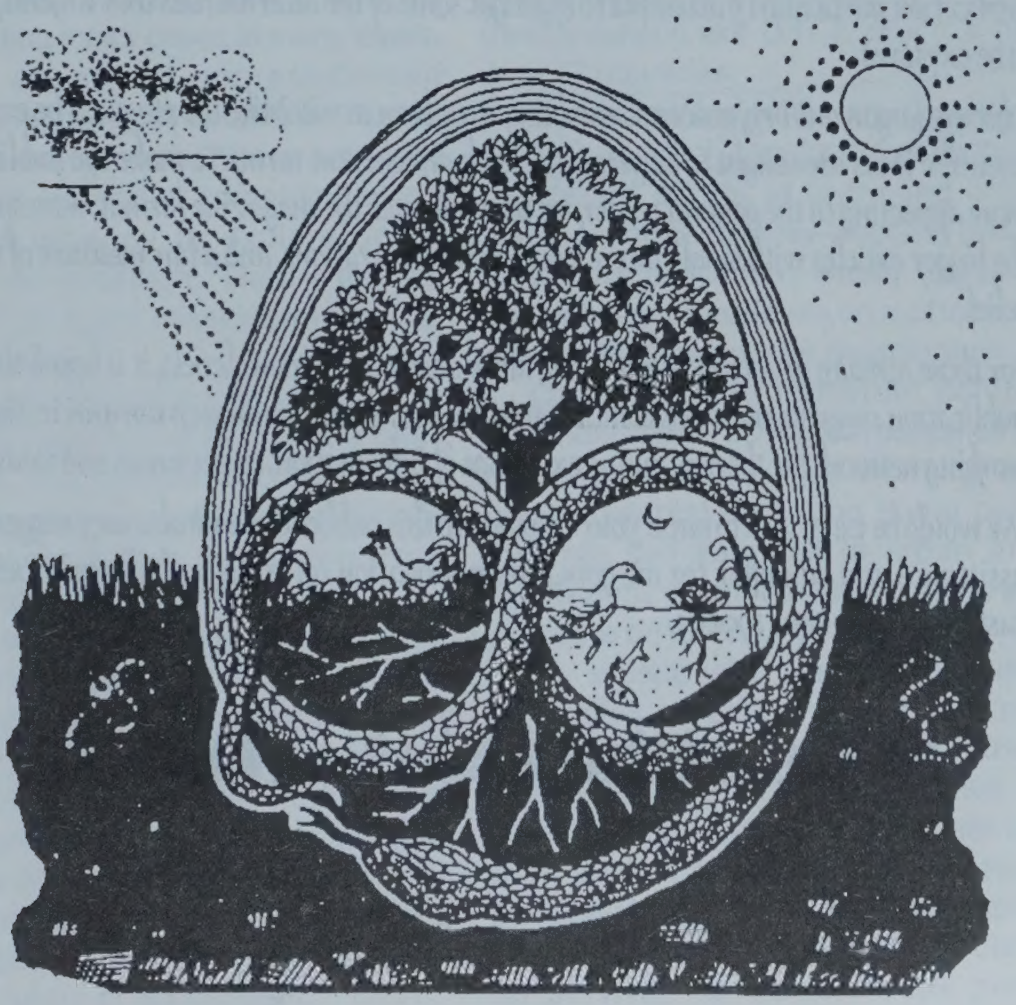
The drinking water in West Bengal with non-acceptable levels of arsenic as reported in various news items containing the debate around the findings would be the new poison flavour added to the water crisis.

The questioning of the success of transgenic cotton trials with the finding that Genetically Modified (GM) cotton was not pest resistant (Times of India, 17.01.2002) leads to the necessity of a public debate on whether India need to be a GM country given the risks associated with GM crops and in a country with 70% agriculture-dependent population.

Education for Co-evolution is given new syllabus by an Englishman Brian Jenkins nurturing children for a eco-friendly future in Sholai School, Kodaikanal in Tamil Nadu.

Ecological Agriculture would be worth a try with our updated networking—thanks to the two of the group which aided networking in 1989—Ardhendu S. Chatterji and Bharat Mansata.

However this could not be exhaustive. We had felt that forthcoming publications of Ecological Visions can alone offer any justification of a complementarity that we spoke about. We decided to explore the possibilities of new ecological visions—possibilities which would address new challenges posed for ecological thinking now. More important in addressing such challenges would be the responses from the readers attempting to face their environmental problems. In what ways this publication had offered different possibilities of looking at your problems—do write to us. Your responses would help us change the way we think. Would change ecological visions...



About this Publication

We had initially intended to bring out a newsletter on ecological agriculture. But as you can see, this publication considerably exceeds that in scope and size! We could not stop ourselves taking up a wider range of inter-related issues that affect the peasant farmer, the city tycoon, and the rest of us.

With so much relevant material available from various sources, even a sampling was hardly possible in less than a hundred pages. We have thus focused on some of the most important issues, and have tried to present the inter-connections between these.

While there is considerable media coverage of the many environmental problems overtaking us, little is said about the deeper roots of the crisis we face, or about what can be done. This publication particularly attempts to highlight some of the alternatives that urgently need to be explored.

Obscure jargon and dry, academic rambling have been avoided like the plague. The essential scientific ideas are sought to be presented in clear, coherent terms. To make the publication more appealing to the general reader, we have adopted the magazine format, interspersing the bigger articles with small, interesting pieces, illustrations, and a fair measure of visual relief.

For those already involved in exploring alternatives at various levels, it is hoped that this publication suggests more possibilities, and also serves as a small step towards initiating a working network for the continuing exchange of information, experiences and ideas.

We would be very glad to have your response to this publication and also any suggestions/ assistance you can offer for on-going communication on ecological alternatives for a sustainable, humane society.

EDITORIAL / PREFACE

Ecology is rapidly becoming the central global concern of our times. The mounting disruption of living conditions we witness today has grave implications for our health and the future of our children. We are unthinkingly leaving behind a sad legacy. While there are some hopeful signs that the coming decade may yet be the crucial turning point, the challenge before us cannot be more momentous.

In the vast cosmic ocean, the earth–our home–is the only many-splendoured jewel of its kind we know of. It has taken millions of years of evolution for nature to cover this planet with its amazing diversity of life forms and to create the conditions necessary for the appearance and survival of humankind. But in a span of mere decades, man has been able to reverse much of that. In his single-minded and short-sighted pursuit of possessions and power, he has been snuffing out the flame of life and precipitating major crises at many levels.

We are in an era of unprecedented extinctions. While the cycle of birth and death is a normal feature on earth, "the prospect of an end to birth is altogether something else." There is great urgency to explore saner alternatives for co-evolution. "Ours is the last generation that still has a meaningful chance" to save the situation.

Confronted with the enormity of problems and the daily struggle for existence, it is easy to feel helpless. Alternatives, however, begin at home. If today, there are worldwide stirrings of an ecological movement, its unifying credo is -'Think Globally, Act Locally'.

For those of us who live in cities, the immediate threat is from toxic chemicals in the food we eat, the air we breathe and the water we drink. 'Gas Chamber City' focuses on the alarming level of automobile pollution in Calcutta. The article, 'For the Life of Calcutta', suggests some of the alternatives which must soon be explored to control this menace and safeguard what is most valuable to us - good health and the future of our children.

Food that is free of dangerous chemicals is another basic condition for health. But chemical-based agriculture, promoted originally as a 'green revolution' by American agribusiness, has made this increasingly difficult to come by - at least in the major towns and cities of India. 'Poison in your Food', the lead feature carried by *'India Today'* in their issue dated 15.6.'89, highlights the gravity of the situation. Extracts from this article are reproduced here. Earlier, in March '89, *Newsweek* had featured a cover story on the big scare in America about chemicals in their overflowing stock of foodstuffs. Ironically, what we in Indian cities get to eat, has a much higher concentration of chemicals which are far more toxic. These pesticides are recklessly promoted, and the farmer, who is kept in ignorance, sprays too much, too often, too close to harvest time and even as a storage preservative. In all likelihood, this spray is a deadly poison like D.D.T. which is banned in over 17 countries.

Sorely needed today are organic food co-operatives which can double as farm-city links. Concerted efforts at re-cycling organic city waste as mulch for alley-cropping and localised re-cycling of kitchen waste for small-scale vegetable gardens (even on roof tops) are other alternatives that can be meaningfully pursued.

Our cities and industrial centres have commonly been 'ecological parasites', hogging scarce resources, while churning out waste and pollutants. By taking some basic steps towards self-help, we in urban areas can significantly contribute to easing the enormous pressure on the countryside.

As individuals, we also find ourselves supporting - directly or indirectly - a number of commercial activities which we know to be ecologically harmful or exploitative. Honesty demands some efforts to extricate ourselves from such a situation - to whatever extent possible. While money remains the dominant consideration for most people in our struggle for survival, its indiscriminate pursuit has

deepened the crisis we are in. The economic success of ethical investments' and 'good work enterprises' in different parts of the world suggests alternatives which we must increasingly explore. With proper management, work that is socially useful and satisfying should also be able to fetch an economic return for the time and money invested.

A vital area which modern-day economics seems to have lost sight of, is 'quality'. As individuals, we owe it to ourselves to give it due attention. What is it that we actually value and why? Of what use are the unending stream of products flooding the market if our basic

The Legacy We Leave Our Children

Armed with spectacular technologies, serving myopic visions of money and power, we have failed to see that forces and events are linked in a larger network of relationships. Our actions have had consequences wider than desired.... We have been irreversibly changing the face of the earth, precipitating grave problems at many levels:

The Desert Spectre: With massive tracts of forests getting wiped out and the loss of vegetation cover everywhere, the roots of trees and plants no longer hold the soil together. Soil erosion has now reached dramatic proportions with the rain and wind washing away enormous quantities of the fertile top soil every year. The steps are short to wasteland and desert.

Fresh-Water Crisis: The loss of trees and vegetation also disrupt the process of water absorption by the soil. The underground water table is no longer adequately re-charged. And as we bore more tube-wells for water-inefficient chemical farming, we are not just borrowing from the earth. We are stealing the birth-rights of our children.

Species Extincion - Nature Plundered: Each year, many thousands of species plants, insects, animals...are being banished from the face of earth, as we cut forests and increasingly adopt cash cropping monocultures of a few hybrid varieties of seeds.

Climatic Extremes: With the earth no longer able to absorb the rainfall, the water run-off causes more floods in the monsoon and more drought in summer. The burning of fossil-fuels leads to accumulation of CO_2, and other gases in the air, with fewer trees available to absorb them. The "green-house" effect of these gases leads to heat retention and global-warming, which is more pronounced at the polar regions. With the ice-caps melting, the rise in sea-level threatens to inundate all low-lying coastal areas and cause widespread havoc.

Poison in the Soil, Air and Water: Alarming levels of pollution caused by toxic chemicals and radio-active emissions as a result of indiscriminate industrial and military industrial expansion, increasing numbers of automobiles and a spreading consumer-culture.

Poison in the Food and in our Bodies: as increasing quantities of toxic chemicals from fertilizers, pesticides and herbicides find their way into our bodies via the food cycle.

Acute Shortage of Bio-mass: for fuel, fodder and raw-materials for housing and crafts. This shortage has reached crisis proportions for large number of people who are marginal to the monetized economy.

Steady Depletion of Mineral Resources and Fossil Fuel: which may seriously disrupt the modern industrial economy in less than two decades.

Shadow of Famine & Misery: Our scant concern for nature's gifts of soil & water, the ruination of the natural fertility of our lands by reckless use of chemical fertilizers based on fossil-fuels (as though these fuels could last forever) ... all signs point to the hovering shadow of famine that is likely to hit us before the turn of the century. The vastly narrowed genetic base of crops also renders our food supplies critically vulnerable to epidemics of pests and diseases, apart from the loss of drought-resistant species.

All the above problems have been thoroughly studied and documented by many people all over the world. The question is: can we yet mend our ways and leave our children a decent chance.

(From 'Writing on the Wall', November, 1986)

physical and mental needs are not satisfied? We need to re-discover that quality is also less expensive if we adopt some simple measures for co-operative self-help. To draw 'maximum mileage' from money and available resources, is, after all, what economics should be dealing with, once we shed the bunkered jargon and obscure figures.

Consumer organizations acting as watch-dog and guidance service are an important step to assure ourselves a minimum level of quality in what we buy. In the least, such citizens' groups can effectively campaign against the more harmful products sold by unprincipled businessmen. Many industrially developed nations, particularly in Europe, are introducing strict regulations to protect the consumer and citizen. With a longer history of modern technological applications and better facilities for research and monitoring, there is greater awareness of the harmful effects of various products and processes that were freely used in the past. While many such dangerous products (like D.D.T and numerous drugs) are now banned in the countries where they were originally developed, in India, as in other Third World countries, these are being increasingly dumped on unsuspecting buyers. Lack of knowledge is no longer an excuse, for today a vast body of well-documented literature is available to inform ourselves. Without vigorous action by citizens for self-protection, we face the prospect of becoming victims of our reckless apeing of the West, minus their traditional safeguards.

While technological progress per se cannot be faulted, we urgently need to consider that indiscriminate industrialization can be potentially explosive for a country like India. Already in the U.S.A., despite its huge ground-area and resource-base, there are ominous signs of a crisis brewing. The increase of toxic pollutants, the waste disposal problem, the degradation of natural resources have all become serious problems of the day. The great American dream is clearly souring.

In India, the population density is about 10 times that of U.S.A. Just the population of our urban areas is equal to or more than the entire U.S.A. population. And the trend for further urbanization, industrialization and 'consumerization' is yet on the rise. Our per capita fuel reserves and mineral resources are a fraction of that in America. While we have been blessed with excellent natural resources (soil, water, climatic conditions) in our much smaller area, we have been almost literally cutting the earth from under our feet by indiscriminately adopting wasteful technologies not suited to our need and conditions.

If dangerous products and technologies continue to proliferate in India at the present rate, then by all reckoning, our myopic chase of the American 'dream' will confront us with a hellish nightmare in less than a decade. This 'little' natural paradise will be metamorphosed into barren wasteland brimming with toxic effluents in town and country-side. And there will be no place to run.

'Power for Industry' and 'Water for irrigation' are the populist slogans raised in defence of the giant Narmada Valley Project which has been described in saner quarters as India's greatest planned environmental disaster. As the largest river valley project undertaken in the world, it envisages the construction of 30 large dams, 135 medium-sized dams and 3000 small dams along the river Narmada. The total cost of the projects will exceed Rs. 25,000 crores. Out of these, 2 huge dams - Sardar Sarovar in Gujarat, and Narmada Sagar in M.P. - are alone estimated to cost more than Rs. 15,000 crores at current prices. Several hundred thousand people will be displaced. In addition to the financial and social costs, the government's own Department of Environment & Forests has estimated that the likely environmental damage caused by these two projects will exceed a colossal Rs. 35,000 crores. It is therefore not surprising that these 2 proposed monster dams have become the centre of a raging controversy.

Pursuing ill-conceived mega-projects like Indira Sagar and Sardar Sarovar is inviting mega-problems that may haunt us much more than the Punjab Issue has been doing.

The snow-balling opposition to the Narmada Sagar and Sardar Sarovar projects is cutting across traditional caste and class loyalities.

In an unprecedented move, over 100 eminent citizens of India from various walks of life have got together to send the Prime Minister a well-reasoned memorandum to call off the construction of these 2 giant dams pending further study and debate on the crucial issues involved. If despite all this, the work on these projects continues, it would seem to mean that short-term considerations of cash flow and political expediency have, for the moment run roughshod over the voice of sanity. There is every danger that the spill-over problems may haunt the nation even more than the Punjab issue has been doing these past few years.

Water is a critical natural resource that cannot be denied to any people. Nor can they be expected to wait for it. It is ironic that the waters from the N.V.P. will reach the dry areas of Gujarat only after 15 to 20 years (if at all, considering that a large percentage of all major irrigation projects undertaken have not been completed till date). For the present, the illusions fanned about the benefits of the project, are detracting attention and resources from simpler and more effective measures which need to be urgently adopted on a wide scale.

Even assuming that construction work on the Narmada Sagar and Sardar Sarovar progresses smoothly, the surfeit of irrigation water, when it becomes available, is likely to assume a counter-productive form in the croplands receiving them. In particular, the black soil areas in the Narmada basin face the threat of getting water-logged and saline. Equally ominous is the danger of farmers in all regions fed by the N.V.P. being drawn into the vortex of chemical-based agriculture promoted under the misnomer, 'green revolution'.

With the government subsidising inputs like inorganic fertilisers and pesticides, there is great temptation to grow mono-culture cash crops, whose high irrigation needs are also met at enormous financial and environmental costs not immediately felt by the farmer. This, however, is a form of deficit farming. After the initial flush of money income, the farmer soon realises that he has eroded his real capital - the soil - by crippling its natural fertility. The land is not only 'hooked' onto external inputs, but with each passing year, more quantities and newer varieties of chemical inputs are required, while productivity tapers off and soon declines.

If one calculates the true ecological costs of the 'green revolution' way of farming, it is clear that this method is grossly inefficient and wasteful. For every unit of energy produced in the form of crop-yield, a very high amount of external energy input is required. The chemical fertilisers and pesticides are based on fossil-fuels, which are practically a non-renewable source of energy undergoing steady depletion. The chemicals also leave a trail of poison in the ground, air, water and the food cycle.

In the hey-days of 'Green Revolution', the American farmer made his hay while the sun was still shining in the form of abundant fuel supplies at ridiculously cheap prices. At that time, one could understand almost anyone being taken in by the promised benefits of the 'green revolution' as a panacea for the world's food problems. Today, it is estimated that if the rest of the world switched to the American way of farming, over 80% of all energy conversion would go into agriculture, and the world would exhaust its fossil-fuel reserves in less than a decade.

The so-called 'Green Revolution' is a form of deficit farming. It ruins the land, and leaves a trail of poison in the earth, the food-cycle and our bodies.

When Rachel Carson wrote in 1962 about the devastating short-term and long-term effects of pesticide poisoning, almost nobody quoted her, or had even heard of her. In the years since, her book *Silent Spring* has been hailed as a great classic, and, a pioneering contribution in the birth of the environment movement. All that she talked about is now perceived as a serious, widespread problem; and many parts of North America, Europe and Australia are today witnessing a significant switch towards ecological strategies of organic/natural farming. The mounting demand for food that is free of toxic chemicals is further adding a fillip to the rising movement for a sustainable and environmentally benign agriculture.

In India, many farmers have ruined their land with chemical agriculture. The environmental,

economic and social imbalances it has triggered have been widely reported and documented. A small mountain of data exists on the subject. Unfortunately, many farmlands are now addicted to chemical inputs and need atleast 2-3 years before alternative strategies can re-generate the natural fertility of the land to a reasonable level of productivity. Worse yet, is the prospect of the 'green revolution' spreading as the agro-chemical industry, propped by government subsidies, seeking to expand in the search of new markets, hiding its unpleasant features behind a misinformation campaign.

There are, however, some heartening reports of a number of farmers who have had the foresight and wisdom to explore alternative organic/natural ways of farming in atleast a part of their farmlands. Some of them learnt early and made the transition from chemical agriculture about 10-15 years ago. Others have changed more recently. In almost all cases, the results have been very encouraging, with the time taken for regeneration of the land being roughly proportional to the damage previously done.

Natural farming or other strategies towards sustainable agriculture are not a return to the traditional method of toiling with the age-old plough. They are an improvement in many ways. However, they all treat the soil as an organic, living medium and shun the use of chemical fertilizers and pesticides. Some add manure and/or compost. Others prefer to grow their 'fertilizing agents' on the land, using leguminous (nitrogen-fixing) plants to do the work for them. A common feature of most methods is the re-cycling of plant-matter as mulch to aid fertility, moisture-retention and aeration of the soil. Some who follow Fukuoka's method of natural farming also avoid or minimise tilling and weeding. Yet others are more eclectic and choose whatever they find suitable from old or new methods tried anywhere in the world. A carefully planned, integrated approach like that of permaculture also pays careful attention to the relative positioning of elements in a given situation for the functional design of a sustainable and evolving ecosystem that can meet most needs of a family or community-settlement. A broad over- view of these various alternative methods is presented in the article 'What is Organic?'

Ecological agriculture improves yield through improving the natural fertility of the soil by a strategy of co-operation.

A major objective of this publication was to present news of the work done in India in the broad field of sustainable agriculture. Accordingly, in April this year, we wrote to many people we knew of to share with us their experiences - the methods they followed and the results they had. A number of these people wrote back, and some were personally visited. Reports of their work constitute a significant part of this publication. For constraints of space, we had to do a fair amount of editing. However, we have listed their names and addresses so that those who want more detailed information can write directly to the persons concerned. It is hoped that this publication helps initiate a network for the continued sharing of experiences, ideas and seeds.

An awesome responsibility rests on us to stem the tide of destruction and regenerate the land so that our children and future generations inherit a habitable, if not a congenial environment. Deforestation, soil erosion and decline in the water-holding capacity of the land are extremely serious and widespread problems of the day. The drought-prone and flood-prone areas of the country are steadily increasing each year. And with the under-ground water table rapidly falling as precursor to desertification, we urgently need to adopt measures for rainwater harvesting and its ground storage. Simple, low-cost and labour intensive earthworks like contour bunds/ swales (followed by tree plantings) are some of the crucial alternatives which can go a long way in re-generating the land and replenishing the underground water table. Also needed are small dams, percolation tanks and other such decentralized initiatives which are far more cost-efficient and ecologically benign compared to large-scale irrigation projects. As an alternative strategy for the ecological development of the nation, they hold forth immense employment potential for productive

work of great and lasting importance. If such activities are undertaken with the true grass-root participation of local people at all levels, then the recent amendment to the Panchayati Bill can go a long way in redressing environmental problems and improving the living conditions of rural people. If however, the old competitive style of politicking persists, then the real issues are likely to get side-tracked in Centre-State and inter-Party tensions.

Irrational competition is subverting the functioning of most institutions today. Our attitudes carry a sub-conscious feeling that 'it is us against the environment' or 'I against another'. And inevitably everyone is a loser, for it is this exaggerated competitive-aggressive behaviour which is now at the root of the major problems we face. Our 'destinies' on earth are inter-linked — more obviously so than at anytime in the past.

'Education for Co-evolution' is an important theme which we have briefly tried to explore in this publication. While institutions tend to be resistant to change, informal alternatives must also be explored for a fuller and more relevant education for our children (and us!). In its broadest sense, education has to do with all of living. 'Meaning' and 'quality' are its central concerns.

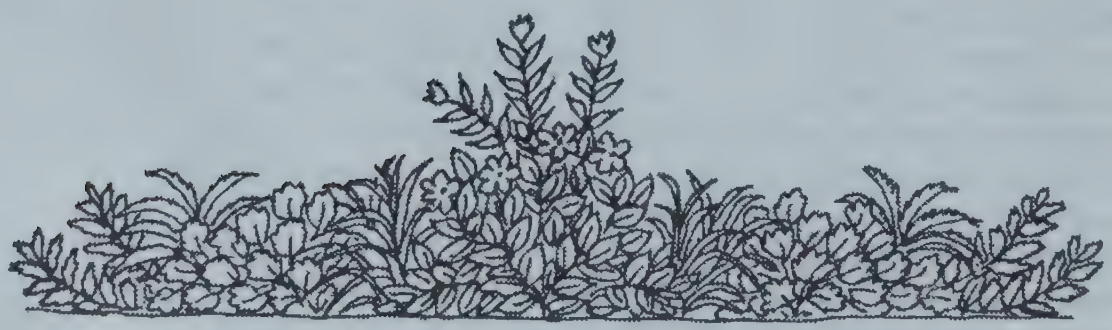
This publication has also touched upon various possibilities for cooperating and 'work-netting'. It is hoped that this will be an aid in the exploration of saner alternatives.

The Way Out of the Cul-de-Sac

As we humans seem to heading for an evolutionary cul-d-sac, the most creative and intuitive will still be trying to tell us that the way out of the box is to re-define the problem: to look up from our pre-occupation with retooling the world and focus on our evolutionary task of developing ourselves.

Standing at the brink of a precipice and surrounded by enormous problems, the prospects of evolution may seem quite hopeless. But then, everything in nature's glorious trail of evolution has been miraculous. Our life is the story of how one little chunk of flaming sun cooled into this unique planet earth. How after mysterious transmutation of elements, life suddenly appeared and then evolved into myriad forms. Our life is the amazing story of little seeds that give birth to mighty trees. And of how the perfect new-born baby miraculously happens from the simple union of sperm and ovum! This little child, bustling with life, who knows whether she or he will grow into a genius of music or letters, or a human saint of wisdom or simply another unique human in the community of life?.

Yes, we are standing at the brink, and it is simply a question of which way the mind of nature evolves from here. Our whole life is the challenge of confronting the miraculous. And quality in living is but an article of faith.



Wasteland Planet or Whole Earth ?

• "Man has long lost his ability to foresee and forestall. He will end by destroying the earth."

— Albert Schweitzer

• "For as long as Man continues to be the ruthless destroyer of lower living beings, he will never know health or peace. Indeed, he who sows the seeds of murder and pain cannot reap joy and love." — Pythagoras

Ecology Down the Ages

• The writers of history have seldom noted the importance of land use. They seem not to have recognised that the destinies of most of man's empires and civilisations were determined largely by the way the land was used. While recognising the influence of environment on history, they fail to note that man usually changed or despoiled his environment.

How did civilised man despoil this favourable environment? He did it mainly by depleting or destroying the natural resources. He cut down or burned most of the usable timber from forested hillsides and valleys. He over-grazed and denuded the grasslands that fed his livestock. He killed most of the wildlife and much of the fish and other water life. He permitted erosion to rob his farm land of its productive topsoil. He allowed eroded soil to clog the streams and fill his reservoirs, irrigation canals, and harbours with silt. In many cases, he used and wasted most of the easily mined metals or other needed minerals. Then his civilisation declined amidst the despoliation of his own creation or he moved to new land. There have been from ten to thirty different civilisations that have followed this road to ruin (the number depending on who classifies the civilisations). The ecological problem, it seems is not as new as it is frequently made out to be. Yet there are two decisive differences, the earth is now much more densely populated than it was in earlier times and there are, generally speaking, no new lands to move, to; the rate of change has enormously accelerated, particularly during the last quarter of a century.

— The Gaia Atlas of Planet Management

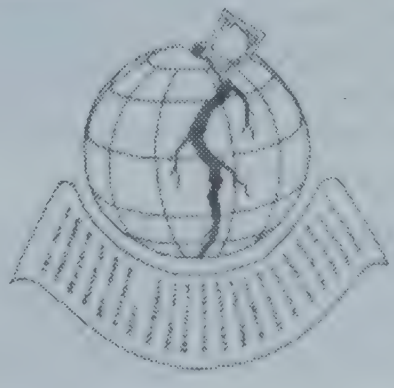
• They make a desert and call it peace.

— Tacitus

• As people, we need to adopt an ethic of right livelihood, for if we bend our labours and skills to work that is destructive, we are the destroyers. We lay waste to our lives in proportion to the way in which the systems we support lay waste to the environment. It is time to invest in life. We cannot profess or teach one ethic and live another without damage to ourselves, our common resources and future generations... Meaning in life is lost by striving after status & future glory, it is gained and realised by action towards a common ideal, in serving the whole according to our capacities. It is never enough to mean well. ("fair words plant no cabbages") Rather it is necessary to ensure that it gets done.

... There is so much damage to ecosystems, so much rehabilatative work to do, that we will be employed in good works for a few centuries to come.. In several generations - if we are allowed this time - we may have achieved a truly free world of international affinities, but we always start where we are.

— Bill Mollison



• ***Fragile Earth***

I apologize for our mutilation of you...
We are so aggressively caught up
in millionairehood
that we treat you
as expendable.
(Eda Howink, From "The Cosmic Womb'.)

THE GAIA HYPOTHESIS

Lovelock (1979) has perhaps best expressed a philosophy, or insight, which links science and tribal beliefs: he sees the earth, and the universe, as a thought process, or as a self- regulating, self-constructed and reactive system, creating and preserving the conditions that make life possible, and actively adjusting to regulate disturbances. Humanity however, in its present mindlessness, may be the one disturbance that the earth cannot tolerate.

"The Gaia hypothesis is for those who like to walk or simply stand and stare, to wonder about the earth and the life it bears, and to speculate about the consequences of our own presence here. It is an alternative to that pessimistic view which sees nature as a primitive force to be subdued and conquered. It is also an alternative to that equally depressing picture of our planet as a demented spaceship, forever travelling, driverless and purposeless, around an inner circle of the sun".

—J.E. Lovelock, 1979

The State of India's Environment, Pub. C.S.E.

• According to the 'seventh generation' concept of the American Indians (Iroquois nation), decisions to be carried out now are judged in terms of their benefits or disadvantage to descendants in seven generation's time (about 100 years ahead). This perhaps explains why tribal managed lands have normally been rich in natural resources, and why we have managed to ruin much of the resources we inherited.

• The problems of today do not come with a tag marked 'energy' or 'economy' or 'CO_2' or 'demography', nor with a label indicating a country or a region. The problems are multi-disciplinary and trans-national or global.

The problems are not primarily scientific and technological. In science we have the knowledge and in technology the tools. The problems are basically political, economic and cultural.

—Per Lindblom,
Federation of Institutes of Advanced Studies

• Africa is full of lonely peasants; millions of people alienated from one another by destruction of nature... Forests recede day after day and the peasants walk farther and farther for firewood. As the rivers and springs dry up more often, they walk farther and farther for water. As the land gets degraded, the lonely peasant toils only to harvest less year after year ... Lamentation alone does not provide enough insight of the predicament of the lonely peasants. When nature recedes, so do the prospects for their wellbeing. Those threads that tie the peasants to nature are too deep rooted; their disruption leaves severe wounds on the health and collective consciousness of the people. The lonely peasant is a grim reminder to the rest of humanity of the ultimate implications of a lonely planet.

—Calestous Juma,
Kenyan Journalist

Protecting Nature

• When the Antarctic Treaty was signed in 1959 the professed objective was scientific research to find out more about the earth's climate, rainfall, oceanic tides, etc. But unfortunately the rich and powerful who rule the earth expect a return for the money they spend on research, and, altruism turns into greed. So now they are planning to exploit the icy region for its mineral wealth of petrol, gold, iron, uranium and coal. France has sent a team of construction workers to build a runway for heavy transport planes to land with earth-moving machinery. And now it is the Greenpeace that is fighting the ecological battle. A band of devoted men and women, it has already had a skirmish with the French a few years ago resisting French nuclear explosions. It has seen its ship "Rainbow Warrior" blown up and a member killed. But this has not diminished its ardour to protect the earth from human rapacity.

It has acquired another ship, the Gondwana, and its crusaders are throwing themselves in front of the bulldozers being used by the French workers. Some have been badly wounded. Afraid of world-wide censorship, the French commander has ordered his

workers to stop work, but this is only a temporary victory. The incident has, however, compelled the French to admit that they have breached the Antarctic Treaty and that vast colonies of the Antarctic flora and fauna have been destroyed. Penguin colonies have been blown up, & nest sites of other birds have been levelled up.

A French scientist has said that mineral exploitation in the region, given the hunger for raw materials and energy sources of the world, is inevitable. The Greenpeace, in its ship Gondwana, is only postponing the destruction of the earth by the thinning of the ozone layer, the green house effect and the melting of the polar icecaps, which will both change the climatic conditions and submerge many island-countries and coastal cities. But let us be grateful that this brave band of dedicated environmentalists is at least delaying that final fiasco.

— Mirror, June 1989

A Bleak Future

Rapid industrialisation poses a threat to the Arctic region

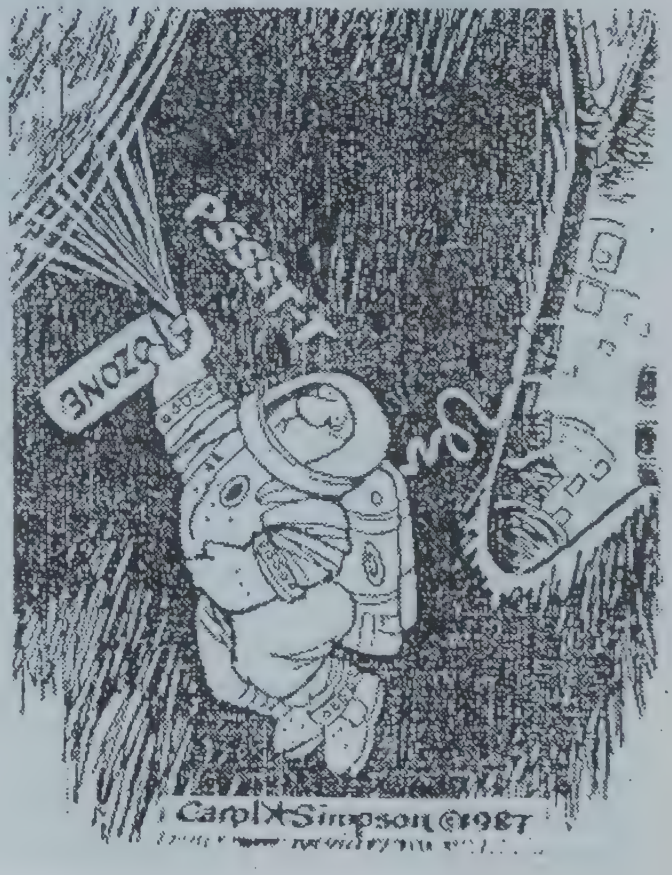
At least 80 per cent of the Arctic will be damaged by 2050, if industrialisation continues at current rates, claim scientists of the United Nations Environment Programme (UNEP). Activities such as mining, oil and gas exploration and construction of roads are threatening the Arctic's rich and abundant wildlife, with birds and larger mammals such as reindeer, caribou, polar bears, wolves and brown bears at the highest risks. These are the findings of UNEP's global methodology for mapping human impacts on the biosphere (GLOBIO), which for the first time has analysed the cumulative impacts of human activities on the environment.

"At the turn of this millennium, less than 15 per cent of the Arctic's land was heavily impacted by human activity and infrastructure. However, if exploration for oil, gas and minerals, developments such as hydro-electric schemes and timber extraction continue at current rates, more than half of the Arctic will be seriously threatened in less than 50 years", says Klaus Topfer, executive director of UNEP.

The report estimates significant human disturbance even at lower growth rates of infrastructure. It concludes that 40 per cent of the region's wildlife and ecosystems will be critically disturbed by 2050, if growth occurs at 50 per cent over the same period, 90 per cent of the Arctic will suffer significant human-induced disturbance by 2050.

Studies of more than 100 species show that some Arctic animals will suffer as the region becomes industrialised. The Arctic birds will suffer due to the drainage of wetlands for development and increase in noise pollution from vehicles.

Source : *Down to Earth*, July 15th 2001



CITIES FLOODED BY SEA

• The burning of fossil fuels and, to a lesser extent, the loss of vegetative cover, particularly forests, through urban-industrial growth increase the accumulation of CO_2, in the atmosphere.

..After reviewing the latest evidence on the greenhouse effect in October 1985, at a meeting in Villach, Austria, organized by the World Meteorological Organisation (WMO), the UN Environment Programme (UNEP), and the International Council of Scientific Unions (ICSU), scientists from 29 industrialized and developing countries concluded that climatic change must be considered a plausible and serious probability.

... They estimated that if present trends continue, the combined concentration of CO_2, and other greenhouse gases in the atmosphere would be equivalent to a doubling of CO_2 from pre-industrial levels, possibly as early as the 2030's and could lead to a rise in globally averaged surface temperatures, of somewhere between 1.5 Deg.C. and 4.5 Deg.C, with the warming becoming more pronounced at higher latitudes during winter than at the equator.

An important concern is that a global temperature rise of 1.5 to 4.5 Degree C. with perhaps a two to three times greater warming at the poles would lead to a sea level rise, inundating low-lying coastal cities and agricultural areas. ...Many countries could expect their economic, social and political structures to be severely disrupted.

— Extracted from "Our Common Future, The Report of the World Commission on Environment and Development", 1987, Chaired by Gro Harlem Brundtland, P.M. of Norway (Book published by OUP, 400 pages, 5.95 Pounds)

Note : According to several scientists, the melting of the ice-caps as a consequence of the green-house effect, could possibly lead to the flooding of cities within the next two decades (Reported in Newsweek, 1986, Australian Edition).

• Out of India's 3,119 towns and cities, only 209 had partial and only 8 had full sewage treatment facilities. On the river Ganges, 114 cities, each with 50,000 or more inhabitants dump untreated sewage into the river each day. DDT factories, tanneries, paper and pulp mills, petrochemical and fertilizer complexes, rubber factories and a host of others use the river to get rid of their wastes. The Hooghly estuary (near Calcutta) is choked with untreated industrial wastes from more than 150 major factories around Calcutta. Sixty percent of Calcutta's population suffer from bronchitis, pneumonia and other respiratory diseases related to air pollution.

— Centre for Science & Environment
(from the 'State of India's Environment:
A Citizens' Report,'New Delhi, 1983.)

Entropy

•... No one speaks for future generations at the market place and for this reason, everyone who comes after us starts off much poorer than we did in terms of nature's remaining endowment.

... When we glorify high energy production, what we are really promoting is an ever greater consumption of the finite store of resources of the planet. Seen in this way, the gross national product is more accurately the gross national cost.

... It requires roughly one-third of the world's annual production of mineral resources to support 6% of the world's population residing in the U.S.

... When Western-style progress comes to a Third World nation, instant underdevelopment is usually the result. The masses of people in these countries actually become poorer than before development began. The major reason for this is that Western industrialism favours cities over rural areas, and highly centralised energy and capital-intensive production over human labour.

... The Green Revolution has the effect of forcing peasant farmers off the land. Because of expensive inputs of energy, small farmers are squeezed out of the market, and are forced to move to the city in search of jobs. By the year 2000, it is estimated that I billion more people will be jammed into Third World urban areas than those living there in 1975.

... Further, if the world converted to the U.S. model of agriculture, upto 80% of all energy conversion would go into food production, and we would exhaust all petro-chemicals within a decade.

— Jeremy Rifkin (From 'Entropy')

Carcinogens float freely in city air

(The Telegraph, Calcutta)

BREATHING TO DEATH

The Metropolitan, Calcutta

City of pollution

(Business India, Bombay)

POISON IN THE AIR - I

Poison in the air - II

Official apathy to health

By Bachi J. Karkaria (The Statesman, Calcutta)

Calcutta pollution reaches killer level

By Umesh Anand
(The Telegraph, Calcutta)

Is Calcutta becoming a gas chamber ?

By Bachi J. Karkaria
(The Statesman, Calcutta)

GAS-CHAMBER CITY !

(Extracts from newspaper and magazine reports on air pollution in Calcutta)

• "Don't drink the water, don't breathe the air", tourism's old cliche is definitely not funny in Calcutta which is moving with macabre determination to hit **the top of the world's pollution chart.**

... But apart from the handful of scientists pouring over their filters and micro-analysers, no one certainly not the planners, who have to do something about it knows exactly how much danger hovers in Calcutta's murky air.

-Bachi J. Karkaria
(The Statesman, Calcutta, 24.4.87).

• There is a high concentration of cancer-causing hydrocarbons and toxic metals, and the dustfall is 20 times in excess of the safe limit.

... The air is so heavily loaded with pollutants that in just 15 years people are exposed to the same amount of hydrocarbons and toxic metals as would be given to a test animal to induce cancer. **It is estimated that already 60 percent of the city's population suffers from respiratory ailments.**

... The city has become so heavily built up that there is just 0.45 acre of open and green space per thousand persons when a healthy balance would be seven acres.

- Umesh Anand
(The Telegraph, Calcutta, 16.01.88).

• **A study of the T.S.P. (Total Suspended Particles) revealed that it was three to five times higher than in any other city in the world.**

... A large number of asbestos fibres were found. These were capable of penetrating the lungs and were often responsible for lung diseases, including lung cancer. Toxic metals were also found in high quantities. These included lead, nickel, chromium, cadmium, mercury and arsenic.

The most startling discovery according to the report is the presence of uncommon metals like thorium, yittrum, zirconium and tantaluim in the atmosphere.

- The Statesman, Calcutta,11.10.84

• **A filter lying exposed at the 8B bus stand turned completely black in two hours. Dr. Chakravorty has taken samples the world over, but has never seen this happen.**

- Umesh Anand
(The Telegraph, Calcutta, 08.12.88)

• **The lead concentration of 6 micrograms/cubic metre in the air of Calcutta is the highest in the world.**

-Indranath Chattopadhyay
(The Metropolitan, Calcutta)

• Two millenia since the first description of lead poisoning (in ancient Rome) appeared, two centuries after Benjamin Franklin documented the effects of lead, and a half a century after lead poisoning in children was traced to lead paint, this metal continues to be freely used. Calcutta's air has 6.63 micrograms of lead per cubic metre compared to Berlin's 1.40 during one of its worst episodes.

The anti-knocking agent so cavalierly added to petrol is made of organo-lead compounds, 300 to 400 times more toxic than inorganic lead compounds. These are spewed into the air from vehicles. Most of the lead in the air is less than one micron in size and easily penetrates the lungs as far as the alveoli, from where it enters the blood stream. Lead poisoning leads to abdominal cramps, constipation, loss of appetite, insomnia, irritability, motor nerve paralysis and encephalopathy. In children it could lead to kidney disease, mental retardation, recurrent seizures and optic nerve atrophy.

... There is a very real danger of foetal deformity in the case of a pregnant woman sitting next to a smoker. In a minibus in winter, when the windows are normally shut, CO diffuses through the placenta and so affects the flow of foetal blood to the brain, heart and adrenals. It could cause deformity, brain damage, spontaneous abortion or still birth.

- Bachi J. Karkaria.
(The Statesman, Calcutta, 28.4.87)

"I think I'll go in for some fresh air".

• If someone is subjected to 90 decibels of noise a day, he will surely get deaf in 30 years, apart from suffering from a great many health problems.

- Monimoy Dasgupta
(The Telegraph, Calcutta, 20.12.88)

• Air that kills is yet another of Calcutta's many legacies. But are the people really aware of the dangers of living in a polluted city? Of what nature is the pollution and to what extent has it spread? These are the basic lines of a survey undertaken by Dr. Dipankar Chakravorty and his team-mates.

Prof. Chakravorty, who teaches chemical engineering at Jadavpur University, has been entrusted by the Union Government's Department of Environment to measure the actual amount of pollution in Calcutta. Often he can be seen at various places in the city, with his team members, busily working on the Air pollution Survey programme.

Surrounded by his paraphernalia at Gariahat Junction, says Dipankarbabu : "There is no intention of creating panic among people. We are only trying to make them understand the magnitude of the problem". His gadgets include the lowvolume Sampler which inhales air at the same rate that a normal person does in Calcutta. Filters placed at the other end absorb the inhaled air. Pointing out a few completely blackened filters, the surveyor remarks: **"The lungs of the Calcuttans might be as black as those filters."**... The time has come for every conscientious citizen to take stock of the grim situation and think of necessary measures. Although a lot depends on the government, a Herculean task like that of purifying the environment can never be undertaken without the active help and cooperation of the people.

- Indranath Chattopadhyay
(The Metropolitan, Calcutta)

• According to studies conducted by the National Environmental Engineering Research Institute (N.E.E.R.I.), the sulphur dioxide concentration in the principal commercial areas of the city generally exceeds during winter, the normally accepted threshold (or danger) level. This explains perhaps the high occurence of bronchial diseases and asthma in Calcutta. According to the readings obtained, the city has about the highest concentration of suspended particulate matter (S.P.M.) among the major metropolitan cities of the world.

The N.E.E.R.I. study reveals, a steady increase in levels of S.P.M. since 1977, with a 60% increase over the last decade. The 1982-83 average concentration was a staggering 418 micrograms per cubic metre. In the winter months, it exceeded 900 micrograms per cubic metre in Dalhousie Square and other busy areas of the city. Corresponding figures for some major cities : London (Feb- May,1971) - 96.0; Chicago (1970) - 86.5; Nagoya, Japan (Oct. 1973 to Oct. 1974) - 88.8; Bombay (1982-83) -148; Kanpur (1982-83) - 307; Madras (1982-83) -145, and Delhi (1982-83) - 328.

Why is Calcutta so frighteningly polluted ? Says Dr. Chakraborty: Seventy percent of our vehicles, and perhaps 90% of the state transport buses would not clear the emission tests of European or American cities. Indeed, though there are fewer vehicles here, the average Calcutta automobile is probably equivalent, pollution-wise, to Ten Western or Japanese cars. And when these badly maintained vehicles get stuck bumper to bumper in traffic jams, the situation is further aggravated because engines on low gear emit great amounts of carbon monoxide and poly-nuclear hydrocarbons.

-Parta S. Banerjee
(Business India, May 6-19,1985)

Indoor Air Pollution — The 'Unseen' Devil

Smoke, dust, heat, sweat, pollution - something we encounter everyday while travelling from one place to another. Many a times when we have bouts of cold, coughs, fever or some other illness we blame it on the dirty polluted air outside. We then confine ourselves inside the safe haven of our homes - insulating ourselves from the polluted air outside. But are our homes really safe and unpolluted?

Research has shown that the indoor environment can be as polluted as the outdoors. We spend considerable time inside our homes and workplaces. This exposes us to a range of dangerous pollutants, from most unlikely of sources that can cause serious health problems and illnesses.

How safe is your home?
Indoor air quality refers to the physical, chemical, and biological characteristics of air in the indoor environment within a residential/institutional building or a commercial facility.

Have you ever thought that the things we use to beautify our homes like furniture, carpets, drapes, floor tiles, paints, and other products like room deodonzers, toiletries, food containers can emit pollutants which are if not more, equally dangerous as the outdoor pollutants. Indoor pollutants can be a severe health hazard due to proximity to the source of pollution, higher levels of some pollutants, less dilution of enclosed air, and reduced air-exchange rates. The most susceptible groups are the children and the elderly who spend considerable amount of time indoors.

Sources and Pollutants of Indoor air pollution
A number of sources that are the leading cause of indoor air pollution can be broadly classified into following categories:

1) **Off-gassing building materials.** Most of the building materials emit large amounts of toxic fumes and other pollutants like radon, heavy metals, Volatile Organic Compounds (VOCs) etc., that are a proven health hazard. Even the stones, used in masonry and aggregates for concrete, like granite may be a source of radon gas. Paints are sources of heavy metals and the carpets of some other VOCs

VOCs. They are a variety of organic compounds that keep emanating from various household items like cleaning compounds, solvents, paints, cosmetics, fungicides, and other consumer products like disinfectants, room deodorizers, shoe polish, aerosol sprays, cosmetics, carpet waxes etc. Pesticides are one of the most important VOC compounds commonly used to kill a variety of common household pests like rodents, insects, weeds, fungi etc. Some other types of VOCs are formaldehyde, tobacco smoke, chlorinated water supplies, benzene, toluene, styrene, naphthalene and chloroform emanated from dry-cleaned clothes.

Radon - 222. This Noble Gas, is produced in the decay of naturally occurring Uranium-238. The principal source of radon in buildings is natural radon gas in soil that tends to penetrate through sump pump wells, drains, cracks, utility access holes, and foundations. It can also diffuse through

Construction materials are loaded with a variety of chemical compounds that are the major pollutant sources which include:

1. Materials containing binders like fiberglass insulation, chipboard, plywood, and particleboard
2. Materials made from petro-chemicals such as foam insulation, gaskets, furniture padding, carpet pads, softer plastics
3. Paints and coatings like oil based paints, stains, and solvents.
4. PVC glues, vinyl adhesives, and related solvents.

the basement walls and floors that are in contact with soil containing radioactive materials.

Airborne Lead. Paint is the chief source of lead pollution inside homes. Old houses and furniture that are coated with lead paint also contribute to indoor air pollution. Even the lead that remains outdoor in the soil near roads and highways tends to become airborne and carried inside homes. Art and craft materials like adhesives, dyes, thinners are an additional source of airborne lead.

Asbestos and Mineral Fibers. Are commonly used in a variety of building construction materials for insulation and as forcing agent in cement, brake linings and plastics. It is also found in older homes, in pipes and furnace insulation materials, millboard, textured paints and other coating materials, and floor tiles. Any improper attempts to remove these materials can release asbestos fibers into the air in homes, endangering people living inside.

DID YOU KNOW

- According to U.S. Environmental Protection Agency (EPA) the indoor level of many pollutants may be 2-5 times, and occasionally more than 100 times, higher than outside levels. Source: http://www.wherethetruthlies.org.
- People spend as much as 90% of their time indoors.
  Source: http://www.epa.gov/iaq
- In a 1996 study on deaths due to air pollution, revealed a total number of 373,000 deaths due to indoor air pollution and 70,000 deaths due to outdoor air pollution which implies an approx. 5 times higher incidence of deaths due to indoor air pollution.
  Source: http://www.panasia.org.sg
- Almost half a million children under the age of five die each year from indoor air pollution in India.
  Source: http://www.economictimes.com
- A study in Western India found a 50 per cent increase in stillbirths in women exposed to indoor smoke during pregnancy Source: http://wbln1018. worldbank.org

2) Pollution from electro-mechanical equipment and appliances

Even carpets can make you sick!

Carpets can be a source of chemical emissions. During installation, carpets emit volatile organic compounds from adhesives and padding used in them. Carpet can also act as a "sink" for chemical and biological pollutants including pesticides, dust mites, and fungi. Various symptoms that may be associated with new carpet installation include eye, nose and throat irritation; headaches; skin irritations; shortness of breath or cough; and fatigue etc.

Remedial Measures: Following remedial measures can prevent Pollution caused by new carpet installation:

- Ask retailers for information to help select lower emitting carpet, cushion, and adhesives
- Before new carpet is installed, ask the retailer to unroll and air out the carpet in a clean, well-ventilated area.
- Consider leaving the premises during and immediately after carpet installation or schedule the installation when the space is unoccupied.
- Open doors and windows to increase the amount of fresh air indoors, this will reduce exposure to most chemicals released from newly installed carpet.
- Ventilation systems should be operated during installation, for 48 to 72 hours after the new carpet is installed.

Source: http://www.epa.gov/iaq/pubs/hpguide.html

Organic particles are the major pollutants produced during the use of electrical gadgets like lights, buzzers, flashes, and beepers. These organic particles are actually the electro magnetic field generated by all electrical equipment including copying machines and electrostatic air cleaners.

3) Biological sources (molds, mildew, spores, microbes, and pet dandruff)

Biological contaminants are living organisms that include bacteria, viruses, mold, mildew, animal dander (flakes of dead skin from pets), dust mites and pollens. They may result from inadequate maintenance and housekeeping, water spills, and excessive humidity in a building. Dust Mites are one of the most highly allergenic contaminants found indoors in house dust. Mold spores are the reproductive units of fungi that survive by decomposing and absorbing nutrients from food, or even wallpaper and carpeting.

Air Fresheners (or Air Poisoners ?)

"Air fresheners" are in continuous supply in our kitchens, bathrooms, and around the house to give us a clean and elegant feel. Thought to be an air quality-improving agent they invariably add a number of pollutants in our household. Some of these pollutants may be designed to deaden our senses of smell, serving as propellants, and yet some others may be adding various kinds of toxic perfumes. Many of these ingredients cause irritation of nose and lungs, leading to serious problems for many people. A prominent constituent of these products is formaldehyde, one of the worst offenders of respiratory system. People suffering from ailments like lung infections, asthma are severely affected by these compounds.
Source: www.wherethetruthlies.org

4) Combustion (furnaces, fireplaces, cigarettes, cooking)

Any form of combustion whether smoking a cigarette or burning toast produces unhealthy byproducts like carbon monoxide, and nitrogen dioxide. In addition, depending on fuel type and additives used combustion may result in emissions of metals, sulfur oxides, or other particles. Many studies indicate that cooking gas ranges can raise indoor nitrogen dioxide concentrations above ambient levels.

Environmental Tobacco Smoke (ETS).

Is a complex mixture of gases, vapors, and particulate matter and is a major source of a large number of indoor contaminants. ETS contains more than 4,000 substances more than 40 of which are known to cause cancer in humans or animals[1]. In homes even the short-term concentrations of ETS can be fatal.

Carbon Monoxide. This poisonous gas sources out from unvented kerosene and gas space heaters; leaking chimneys and furnaces; wood stoves, and fireplaces.

Nitrogen dioxide ($N0_2$) and Sulphur dioxide ($S0_2$). Are another group of pollutants, whose primary source is tobacco smoke and combustion processes which involve biomass fuels (or cooking). According to a study conducted in New Delhi indoor nitrogen dioxide levels for households using natural gas and traditional fuels, were 3 to 5 times more than the outdoor levels[2].

5) Cleaning, and maintenance compounds

The household cleaning agents and maintenance compounds are also sources of hundreds of potentially harmful chemicals. These products release contaminants into air right away while other do so gradually over a period of time.

1. http://www.epa.gov.iaq/pubs/hpguide.html

2. Spengler, JD et al; Impact of Residential Nitrogen Dioxide Exposure on Personal Exposure: An International Study.

Formaldehyde. Is an important industrial chemical, added to medicines, cosmetics, toiletries, and some food containers as a preservative. The largest single use of formaldehyde is in producing urea and phenol resins, which are applied as adhesives in plywood and laminates. These wood products are widely used in homes and offices, as shelving, counters, floors, and wall covers. It is also used to improve fabrics. Wall-to-wall carpeting, often glued to the floor with adhesives, and draperies made of synthetic fibers is a continuous source of a variety of volatile chemicals. Plastic and fabric-covered room dividers can release VOCs as well. Office equipment like photocopying machines also emit a large number of pollutants.

How these pollutants affect your heath?

Common Pollutants, Sources, Illnesses

Home Products/Sources	Common Pollutant	Related Health Effects
Tobacco Smoke, Cleaning supplies	Ammonia, Benzopyrene	Eye/skin irritation, headaches, nose bleeding, sinus problems,asthma attacks, lung cancer
Paint, New Carpet, New drapes	Benzene, Chloroform, Xylene	Headaches, eye/skin irritation, fatigue, cancer, asthma attacks, dizziness
Gas burners, furnaces, wood stoves	Hydrocarbons, nitrogen dioxide, carbon monoxide	Headaches, eye/skin irritation, nausea, cardiovascular and pulmonary diseases
Paints, glues, furniture, wallpaper	Trichlorethylene, Xylene, airborne lead	Headaches, eye/skin irritation, fatigue, respiratory irritation, dizziness, nausea, loss of consciousness, anorexia
Carpet, clothing, dirt, paints, industrial processes, and human skin	Dust	Eye irritation, allergies, eye- ear- nose-& throat-infections, asthma attacks, fatigue, depression
Every inhabited room harbors hundreds of thousands of dust mites. (Typically 10,000 dust mites are found in an ounce of dust)	Dust Mites	Decaying dust mite waste materials are source of indoor allergies. Dust mites may be a factor in 50 to 80 % of asthmatics[3]
Pesticides misapplication	Organic vapor, dust	Headaches, dizziness, muscular weakness, nausea
Construction material like cement, brake linings, floor tiles, and plastics	Asbestos fibres	Asbestosis (irreversible lung scaring)[4], lung cancer
Room deodizers, shoe polish, aerosol sprays, cosmetics	Volatile organic compounds	Eye, nose and throat irritation, headaches, visual disorders, and memory impairment.
Alkaline environments including raw dairy, meat, poultry & vegetables, open wounds	Biological contaminants like Aeromonas bacteria	Intestinal & extra-intestinal infections including meningitis and sepsis
Standing water, air conditioning ducts, moist areas in walls	Biological contaminants (eg legionella, molds)	Allergies, sinus headaches, irritability, fatigue, depression
Drains, cracks, soil gas penetration through sump pump wells	Radon gas	Lung cancer[5]
Medicines, cosmetics, toiletries, food containers	Formaldehyde	Nasal cancer in animals, conjunctival irritation, chest tightness, wheezing
Chemical reagents like chlorine bleach and detergents	Volatile organic compounds (VOCs)	Skin and eye irritation, anemia, liver damage, convulsions, possible coma

3. http://www.wherethetruthlies.org, http://www.healthandenergy.com/dust_mites.htm
4. http://www.epa.gov/iaq/asbestos.html
5. http://www.mwt.net/~roald/indoorair.html

The Indian Scenario

In developing countries like India, wood and other biomass fuels (wood, crop residues, dung cakes) are still the primary source of energy for the majority of people. Biomass fuels combined with open chulhas (stoves) and inadequate ventilation play havoc with lives of two major vulnerable groups: children and women. Wood emits 1.0mg of CO per cubic meter of air — cooking gas emits only 2.8mg — during a typical cooking session.[6] In 1991, the World Bank rated indoor air pollution in developing countries as one of the four most critical global environmental problems. Although there are many hundreds of separate chemical agents that have been identified in the smoke from biofuels, the four most serious pollutants are particulates, carbon monoxide(CO), polycyclic organic matter and formaldehyde. These pollutants are responsible for more respiratory illnesses and decreased pulmonary functions than that from kerosene and cooking gas. The six major categories of ill- health that can be attributed to indoor air pollution are[7]:

- Acute respiratory infections in young children
- Adverse outcomes of pregnancy (low birth-weight, stillbirth, and neonatal death)
- Lung cancer
- Chronic lung ailments (bronchitis or asthma) and associated heart disorders
- Diseases of the eye
- Increase in the severity of coronary heart disease.

Apart from these four major illnesses, indoor air pollution is also associated with blindness and changes in immune system. 18 percent of blindness in India is attributed to the use of biomass fuels[8]. Estimates from a study carried out in India by American scientists, indicate that some 400-550 thousand premature deaths can be attributed annually to the use of biomass fuels in population groups using biomass fuels. Further, it is also estimated that a total of 4-6% of the Indian national burden of disease is from indoor air pollution[9].

What we can do?

The indoor concentration of pollutants can be reduced by:

- Keeping the area in and around your house, office clean and well ventilated to keep away pests.
- Refrain from using chemical pesticides indoors.
- Improving ventilation in the cooking area, using clean fuels, and better stoves, which require less fuel and generate less smoke.
- Avoid using chemical cleaning agents; instead use neem oil for cleaning floors.
- Replace room freshners or deodorizers with baking soda which is a good absorbent of odors in the refrigerators and elsewhere.
- Grow plants in and around your living space since plants are effective in removing toxic vapors and keeping the premises fresh.

(For further information on alternatives to toxins in home, refer to Factsheet "Toxics Free Home")

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Sick-Building Syndrome (SBS)

The term *"Sick building syndrome."* (SBS), first employed in the 1970s, describes a situation In which occupants of a building temporally suffer from symptoms like tiredness and irritation with no specific illness, only during the time of their presence in the building. Another set of symptoms apart from the above mentioned include lethargy or fatigue, headache, dizziness, nausea; irritation of mucous malaise-complaints. A number of contributing elements other than poor design and ventilation include humidity, poor lighting, adverse ergonomic conditions, temperature
extremes, noise, and psychological stresses.

Source:http://www.cpsc.gov/cpscpubs/pubs/455.htm

Source: *Toxics Link Information*
August 2001, No. 14

Deodorants and anti-perspirants
A fragrance of ill-health

In the hot summers, anti-perspirants and deodorants could be the best help in getting rid of excessive sweating and body odours. Available as liquid sprays, sticks, powders, roll-ons or creams, these products rely on different types of chemical reactions to achieve their purpose. Anti-perspirants reduce perspiration and body wetness caused by eccrine sweat glands (these glands regulate body temperature by adjusting the amount of sweat secretion and elimination of the body's waste products). This is achieved by either retarding the flow of eccrine sweat, causing blockages at the mouths of sweat gland ducts or by inflaming the skin around the pores, forcing them to close. Deodorants, on the other hand, remove body odour by killing the bacteria that breaks down the sweat from apocrine glands (which are controlled by the body's hormone system).

Deodorants and anti-perspirants are strong chemicals that may be a complex mixture of astringent salts, aerosols or some other ingredients in water or alcohol solution. Astringent salts such as aluminium chlorohydrate, aluminium phenosulphate, zirconium chlorohydrate, etc, are highly acidic in nature. Aluminium salts lead to health problems such as skin irritation which, in serious cases, could develop into contact dermatitis (a disease in which the skin turns red and develops an itchy or a painful rash). Elevated aluminium levels have been found in the brains of Alzheimer's patients. In addition, zirconium-based sprays can be carcinogenic if inhaled. Triclosan used in deodorants can cause liver damage through percutaneous absorption. Aerosol-based anti-perspirants can cause temporary loss of vision and conjunctivitis. Inhaling a high concentration of aerosol sprays leads to deposition of highly toxic gases such as butane and pentane, which can cause cardiac diseases.

Our body purges toxins in the form of perspiration. Anti-perspirants stop the body from releasing such toxins, which keep accumulating in the lymph nodes. Eventually, high concentrations of these toxins in an area can cause cell damage that may even lead to cancer.

Moreover, such chemicals should be avoided also because of their flammable nature and the health hazards they pose.

Avoid using such sprays by bathing frequently and wearing summer-friendly clothes instead.

Source : INSIGHT

The consumer magazine, Vol 21 (1), Jan-Feb 2001

Indoor air could be more polluted than outdoor's

NEW DELHI: Every year over one million deaths are caused in India by air pollution. Of these, two-thirds are due to indoor air pollution, according to the World Bank statistics.

"It's a myth that outdoor air pollution is more in scale than indoor air pollution. In fact, air in conditioned air spaces can be more polluted due to inadequate ventillation, coupled with recirculation of stale air," says Jagdeep Singh, general manager, Arctic India Engineering Pvt Ltd, a company that provides equipment to improve indoor air quality.

According to the American Society for Heating, Refridgeration and Air-conditioning Engineers (ASHRAE), Indoor Air Quality (IAQ) refers to the nature of the conditioned air around us–through a space or an area, where we work and live.

Since we spend "65 to 90 per cent of our time in this conditioned 'environment' it may be more injurious to human health" and ideal ground for growth of germs. Simple home decoration material like carpets, furniture, paints or even floor-tiles and room-freshners can emit pollutants which are more dangerous than pollutants in outdoor air, according to a study

by Factsheet Toxins Free Home.

Combustion of biomass fuel or burning of toasts and cigarettes is another common reason of indoor air pollution, it says.

Poor quality indoor air makes occupants suffer from tiredness and irritation with no specific illness during their presence in the building. This poor indoor air gives rise to stuffiness, dizziness, nausea, lethargy and fatigue leading to decreased productivity which indicates that the person is suffering from Sick Building Syndrome. (PTI)

Source : Times of India, 4th May, 2002

Striking at the Heart

Pollution causes heart attack

Exposure to elevated levels of fine particles from automobiles for just two hours raises the likelihood of heart-attack according to a recent study in the journal Circulation.

Murray Mittleman, director of cardiovascular epidemiology at Boston's Beth Israel Deaconess Medical Centre, US, who led the study said previous studies linked exposure to particulate air pollution to heightened risk of cardio-vascular diseases, but the new study is the first to look at short-term effects of air pollution on the risk of heart attack.

This type of pollution is produced by combustion processes in automobile engines, power plants, refineries and smelters, added Douglas Dockery, professor of environmental epidemiology at the Harvard School of Public Health, USA. These particles are less than 2.5 micrometers (25/10,000th of a millimeter) in size. Dockery said larger particles such as airborne dust and debris from farming, construction work and mining are far less likely to trigger a heart attack.

These particles are so small that after being inhaled, they can evade the normal defense mechanisms in the lungs and penetrate deeply into the lung's air sacs and their presence there can 'trigger a systemic inflammatory response that can be detected as high levels of a certain protein associated with an increase in heart attack risk', say researchers.

They have tracked pollution levels in the Boston region and interviewed 722 people about four days after they entered area hospitals with a heart attack in 1995 and 1996 for the study. They found that the patients experienced a 48 per cent rise in heart attack risk in the two hours after exposure to high levels of this type of invisible air pollutants. The patients experienced an increased risk even 24 hours after exposure. High amounts of fine particulate air pollution are present typically during very hot, hazy summer days, according to Mittleman.

Source : *Down to Earth*, July 15th, 2001

I don't care any more how you get out of it.
As for me, I have decided to resign!

For the Life of Calcutta

(On alternatives for checking the dangerously high levels of automobile pollution in Calcutta, and some measures for easing traffic congestion.)

As Calcutta makes plans to celebrate its tercentenary, it is still true that this city is vibrantly alive and remains a major cultural capital of the east. But it is also undeniable that the physical conditions of existence in Calcutta are more hazardous than in any other city and are steadily becoming intolerable.

The people of Calcutta encounter alarmingly high quantities of many pollutants which are clearly known to be toxic.

The presence of lead in the air of Calcutta is the highest known to be recorded in any city of the world. This heavy metal is believed to have significantly contributed to the decline and fall of Rome. It can cause brain damage, convulsions, delirium, coma, blindness, paralysis, diarrhoea and even death. In children, it has been known to cause kidney disease, recurrent seizures, optic nerve atrophy and mental retardation.

The Total Suspended Particles (TSP) found in the air of Calcutta are more than twice recorded in any other city on earth. According to some reports, the amount of such suspended particulate matter is 3 to 5 times more than any other city. It is no wonder that the lungs of people living in Calcutta have turned black !

Other pollutants found in very high quantities are: carbon monoxide, sulphur dioxide, nitrogen oxide, asbestos fibres and a number of toxic metals, including some rare ones not reported to be found in other cities. At least 4 carcinogenic poly-nuclear hydrocarbons have also been identified in the murky air over-hanging Calcutta.

While generators, 'chulhas', chemical factories and other industries significantly contribute to fouling the air, the worst culprit behind the "killer level" of pollution in Calcutta is the exhaust emitted from automobiles. It has been estimated that the average Calcutta automobile is probably equivalent pollution-wise to 10 Western or Japanese cars ! One may well ask: how is this conceivably possible?

The road surface area of Calcutta is only 6%of the total area of the city. (The ideal would be about 20%.) The resulting traffic jams force the cars to frequently stop, start and move very slowly. When cars are thus run in low gear, there is a great increase in the emission rate of pollutants. Poor maintenance of automobiles and roads also add to the rate of pollution-spill from exhausts. And because the average automobile in Calcutta spends more time on the roads as a result of slow vehicular movement, the total amount of pollution spilled in the air each day is greater than in a city with many more automobiles.

This high level of pollution cannot get diffused or absorbed as is somewhat possible in the case of better planned cities. Calcutta is severely handicapped by its extremely low ratio of road surface to total area, the high density of construction and the gross insufficiency of trees/open green spaces. Finally because of slow-moving traffic again, commuters are exposed for longer periods to such dense pollution. All these factors taken together easily compound many times the average intake of pollutants by a person living in Calcutta. Winter months are the worst, for the cold air does not rise and the pollution stays settled over the city like a thick, murky carpet.

What are the alternatives?

Key Measure

Of the various measures which can significantly contribute to checking pollution, the most effective and perhaps easiest to implement is to curtail the total amount of traffic plying on the roads. At first, this may seem a startling suggestion, easier said than done. However, it can be put into practice by means of a simple rule whose many and considerable benefits far outweigh the temporary inconvenience caused to a small percentage of Calcutta's population. These few may also soon realise that they have gained much more than they have sacrificed.

The basic rule may be briefly stated as follows:

Private cars having number plates ending with an odd-numbered digit should run only on odd-numbered working days of the month. (e.g. 1st, 3rd, 5th .... etc. of each month). Similarly, private cars with even-numbered plates should ply only on even-numbered working days. Suitable exceptions (e.g. essential services) may, of course, be made.

The merits, prospects and simple support measures to put this thumb rule into practice are discussed below:

Benefits

1) In respect of Pollution, the reduction in the number of private cars on the roads implies:

(i) The absence of pollution from the 50% of

private cars which do not run on a given working day.

(ii) Less pollution emitted from all the other automobiles which do run (including public transport and two-wheelers). This is because less traffic means smoother movement and therefore a big reduction in the pollution spill from the exhausts of the vehicles plying.

(iii) The reduction in commuting time also means a shorter period of exposure to road pollution and therefore a further significant cut in the intake of toxins.

(iv) Fewer runs by cars, by virtue of alternate day rests, means greater possibility of keeping these vehicles better maintained, which would again cut their emission rate of pollutants.

(v) Less traffic means less damage to roads. It also allows the possibility of carrying on repair and maintenance of roads without worrying that the restriction in traffic movement would cause bottle-necks and traffic jams on the other streets. Better maintained roads imply a reduction in the damage caused to automobiles and therefore a reduction in the damage caused to automobiles and therefore a reduction in the pollution emitted by them.

Thus, the simple measure suggested can have a many levelled reinforcing effect in easing the problem of pollution. The enormous benefit this entails for the health of people is reason enough for serious consideration of the suggested measure.

The consequent improvement in quality and output of work are additional factors. So also the considerable saving of money spent on medical treatment for alleviation of the symptoms of disease.

Other benefits include:

2) A considerable saving of average commuting time (which is significant in itself).
3) Less noise from horns and the sound of engines.
4) A considerable easing of the tension that normally accompanies commuting in Calcutta, and which lags on for sometime before one can give relaxed attention to any work.
5) A national saving in the consumption of petrol.
6) For the car owner, the proposed measure could mean less money spent on petrol and car maintenance.
7) There could also be significant increase in the efficiency of the public transport system, because less traffic moving faster would mean that it should now be possible for buses and taxis to do more runs in a day. This virtually amounts to increasing the number of buses and taxis without having to pay for them. Such improvement in efficiency could be as much as 30% or more.
8) Considerable easing of the parking problem for car owners.
9) Easing the work of traffic policemen and making it more manageable. Extra attention can thus be paid to detecting traffic offenders and following up with deterrent action.
10) Possibility of enhanced revenue collection from all categories of traffic rule offenders (for the reason stated at para 9 above.) Also possibility of extra revenue from Toll Fee (See following discussion under "Support Measures".) Such extra revenue may be used for road repairs and improving the public transport system.

STRIKE'S BRIGHTER SIDE

By A Staff Reporter, *The Times of India*,
BOMBAY, August 2.

The present agitation by the transport operators in Maharashtra objecting to some provisions of the Motor Vehicles Act is unique. It is for the first time that trucks, taxis, three-wheelers and auto-rickshaws have gone on strike simultaneously.

Though the residents here feel the absence of taxis and auto-rickshaws, which are an essential part of the hectic life in the city, they have welcomed the relief provided by nearly 40 per cent of vehicles being off the road since yesterday.

One could walk along the road without being forced to inhale exhaust gases from vehicles, cross the road without unnecessarily being scared of being knocked down. There was less noise, pedestrians say.

For the motorists and BEST bus drivers, it is easier driving. They cover the distance now quicker as there is no congestion at intersections.

11) By making Calcutta a more liveable and pleasanter city, it would be possible to attract at least part of the capital being sought. (Conversely, few investors or skilled personnel would like to settle in a city where the physical conditions are already bad enough and getting worse.)
12) Possibility of a level of international recognition at a period of history when environmental considerations are demanding attention from people everywhere. It would not be surprising if other big cities like Bombay follow the example of Calcutta and seriously consider some such package of measures to control traffic and check the problem of atmospheric pollution.

Prospects

The average number of passengers per square metre of road space occupied by a vehicle is the lowest for privately owned cars, compared to any other mode of transport. Thus, on considerations of traffic congestion and atmospheric pollution, private cars are the least efficient. Those who usually travel in private cars constitute less than 10% of Calcutta's population. But by curtailing the movement of these cars to alternate working days and holidays, there could be at least a 40% gain in the speed of traffic movement and at least a 60% reduction in the amount of automobile pollution to which a commuter or pedestrian is exposed. The benefits would be even more if the rule is backed by some of the support measures suggested below.

Given the level of tradeoff indicated, there seems sufficient justification to examine the enforcement of the suggested rule at least for a limited trial period. Further, by highlighting the benefits of the proposal through public media many private car owners may become satisfied that they would emerge net gainers in terms of reduced hazards to health, time saving, money saving, less tension and easing of the parking problem.

The inconvenience to those who move in private cars is not really as much as it may initially seem. They can still use their vehicles on alternate working days and public holidays. With a little prior planning, the larger part of any work that requires moving around the city can be scheduled for the days on which the car can be used. Private car owners would also find it possible to have reciprocal arrangements with neighbours in their vicinity for sharing their cars for commuting between home and place of work. This means that those having cars with odd numbered licence plates could commute on alternate days with neighbours having even numbered car plates and vice-versa. We would thus have more efficient use of cars and less wastage of road space to private cars carrying just one or two persons but continuing to cause as much traffic congestion and pollution.

CARLESS A DAY KEEPS SMOG AWAY

(*Telegraph*, Oct. 2, '89)

Mexico City, Oct. I (AFP): A law forcing drivers to keep their cars off Mexico City's streets one day each week will reduce the pollutants in the air of this notoriously smoggy capital city by 3,000 tonnes a day, authorities say. The emergency plan was announced by the City Hall on Friday in a bid to make the air breathable. It will take as many as 460,000 private cars off the streets each day. Each car will carry a colour-coded sticker to indicate which day it must be left at home. Drivers who disobey will face a fine equivalent to 20 to 30 days of minimum salary.

Taxis, buses, some delivery vehicles, emergency vehicles and government and military vehicles will be exempted. The law will go into effect in November and last until February, covering the cold weather months in which pollution is most harmful.

Support Measures & Alternatives

There are a number of other relatively simple measures which can aid in the smooth implementation of the suggested rule and further contribute to easing the problems of traffic congestion and automobile pollution.

1. Improvement in the frequency of Metro trains, which are now running at a quarter of the planned optimum frequency, and introduction of a monthly card/pass system. By attracting more people to use the subway on a regular basis, the pressure on the surface transport system would be reduced.

2. Introducing the share shuttle-system of taxi operation in which these vehicles run on pre-selected fixed routes and charge fixed rates per passenger as may be decided for each route. By this system, the efficiency of taxis could be doubled as these would now carry four or five passengers per trip instead of just two or three. This is already being done on some routes by an informal arrangement. It could be encouraged, expanded and better organised.
3. Better maintenance of pavements with more over-head trees so that commuters have a pleasanter walk from their home or place of work to the point where they get into a public transport vehicle. Some pedestrians may even choose to walk longer distances under such improved conditions of shaded pavements and reduced vehicular traffic. The trees for shade also play a vital role in mitigating pollution. And for this reason it is crucial to preserve the remaining open, public spaces for trees and parks rather than yield to the temptation of quick money through highrise residential / office / shopping complexes.
4. Actively explore and encourage work-places to follow staggered hours of functioning, and seek the help of the Chambers of Commerce and trade organisations to pursue this.
5. Still other measures are more obvious: e.g. (i) ensure faster restoration work on roads that have been dug up or are under repair. This would reduce bottle-necks in traffic movement, (ii) introduce additional public transport vehicles, preferably some battery operated mini-buses (as found in New Delhi) which do not emit pollution and are noiseless.
6. Periodic checks of the exhaust emissions of automobiles to ascertain whether they exceed the levels specified by the Dept. of Environment. Offenders should be strictly penalised.
7. Among other alternatives aimed at controlling the density of vehicular traffic — and indirectly curtailing automobile pollution — the following possibilities (or some judicious combination of these) also deserve serious consideration.

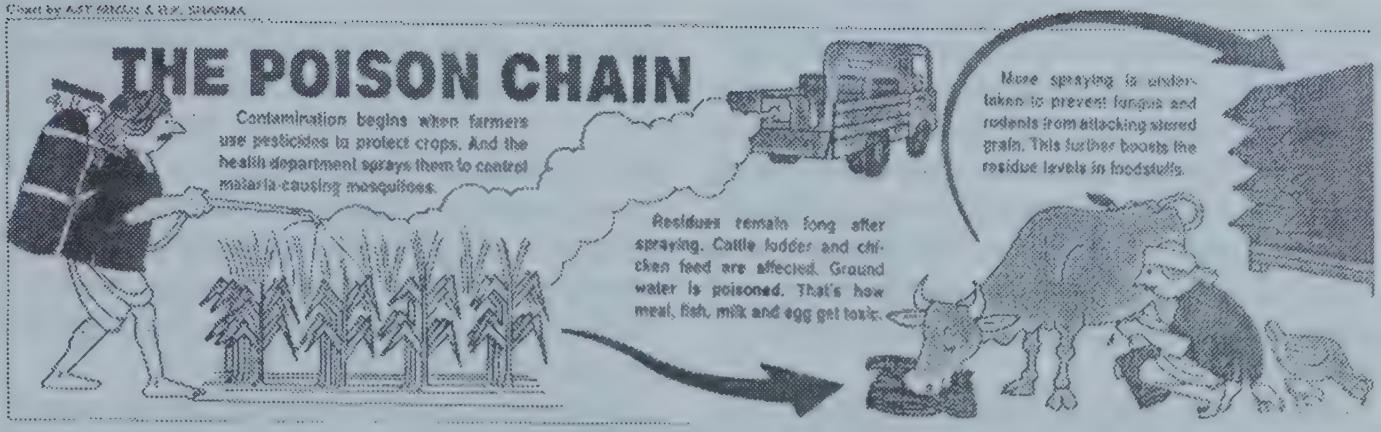
   (i) On certain roads or zones, private cars carrying less than 4 passengers should not be allowed during peak traffic hours. (This is being done in Singapore).
   (ii) An entry toll may be charged for private motor vehicles (four wheelers) entering certain areas (e.g. Central Business District) on working days. Bottle-necks caused as a result of toll collection may be avoided by a monthly pass system. And the rate for casual entry toll should be, sufficiently high to be an effective deterrent.
   (iii) Introduce a carefully planned package of measures to enable and encourage the use of bicycles, at least on certain routes. e.g. some roads, may have strips marked as cycle lanes. Or there may be a linked corridor of minor roads reserved exclusively for cycle traffic during peak hours. (Private cars belonging to residents living along the corridor may be allowed to exit.)
   (iv) Another possibility worth considering is to have one or more "rapid mass transit' corridors along which stops are strictly restricted to a few specified points, not less than one kilometer apart.

The above possibilities are partial measures — inadequate if adopted in isolation. But if these are considered as additional support measures to the main rule curtailing the traffic of private cars on working days by 50% then the chances of effecting significant improvement are greatly enhanced.

In Conclusion

To celebrate the tercentenary of Calcutta in a meaningful way, the people must urgently consider alternatives to remedy some of the serious problems this city faces. Perhaps one may consider initiating a "Calcutta Alive" forum inviting all people to suggest ideas and view-points on how to improve the living conditions of this city. The media might help by stirring the imagination of the people on this subject which deeply affects the lives of all Calcuttans.

- Bharat Mansata


THE POISON CHAIN
Contamination begins when farmers use pesticides to protect crops. And the health department sprays them to control malaria-causing mosquitoes.
Residues remain long after spraying. Cattle fodder and chicken feed are affected. Ground water is poisoned. That's how meat, fish, milk and egg get toxic.
More spraying is undertaken to prevent fungus and rodents from attacking stored grain. This further boosts the residue levels in foodstuffs.

POISON IN YOUR FOOD

(Extracts from INDIA TODAY, 15-6-89)

Ready for dinner. Serve yourself two chappatis and a handful of rice. Choose your pick of dals. And your favourite vegetables. Mustn't forget, the salad: tomatoes embellished with carrots and cucumber. A bowl of curd, and maybe a banana or an orange.

Food faddists will tell you that this meal is a perfectly balanced diet. A similar lunch and a light breakfast would add up to that ideal figure of 2,200 calories daily. Just right to keep you trim and healthy.

Now gird yourself for the bad news. Along with those wholesome meals, **you daily take half a milligram of two of the most widely used toxic pesticides in the country- Dichloro Diphenyl Trichloroethane (DDT) and Benzene Hexachloride (BHC). Not to mention a dash of malathion and endosulfan.**

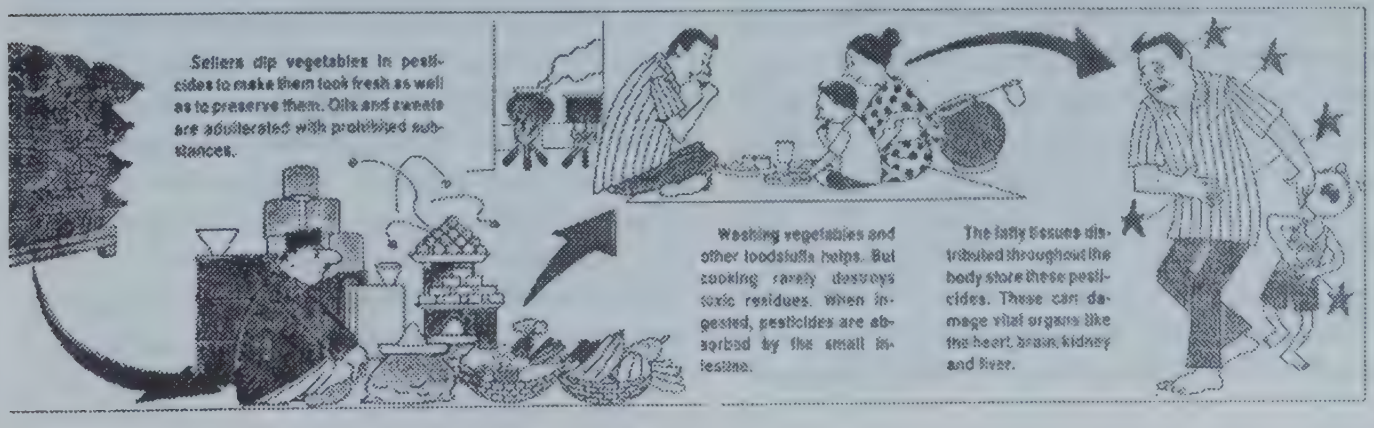
In all that quantity is less than a pinpoint. But that's 40 times more than what average Americans or English ingest with their food. And equals the World Health Organisation danger level for daily intake of these toxins.

It's hard to stomach, but true. It's not just drinking water that you have to worry about. But practically everything you eat. The chappatis and rice, dals and vegetables, meats and fruits and even milk now pose a new threat, not just to us but to our babies also.

Repeated surveys have shown that Indians are daily eating food laced highest with some of the highest amounts of toxic pesticide residues found in the world. In the process, they are exposed to the risk of heart diseases, brain, kidney and liver damage and even cancer.

Even more frightening, studies indicate that right from the day our babies begin to suckle they are taking in pesticides deposited in breast milk. And some ready-made baby foods too are similarly contaminated. "We are not only slowly poisoning ourselves but jeopardising our future generations too," says toxicologist Dr. K. N. Mehrotra, President, Society of Pesticide Science, India in New Delhi.

The impact of such poisoning is usually insidious. But already there are several alarming examples. In Karnataka's Shimoga and Chikmagalur districts,


Sellers dip vegetables in pesticides to make them look fresh as well as to preserve them. Oils and sweets are adulterated with prohibited substances.
Washing vegetables and other foodstuffs helps. But cooking rarely destroys toxic residues. When ingested, pesticides are absorbed by the small intestine.
The fatty tissues distributed throughout the body store these pesticides. These can damage vital organs like the heart, brain, kidney and liver.

since 1975 over 300 people have been struck by a mysterious crippling attack of arthritis. One of them, Giriyapa, 50, a farm labourer, was among the ablest men of his village. Suddenly, he developed pain in his knees. Soon he found his muscles wasting away and within a year he had become a cripple. He now crawls around on his hands. "If it wasn't for my sons I would be starving," he says. In children, the disease, apart from crippling them, has inhibited their growth.

Initial studies indicated that these people, mostly farm labourers, had switched to eating crabs from nearby fields after their wages were cut. These fields were being sprayed with pesticides regularly. And in the classic food chain link, the villagers who ate the crabs are believed to have been poisoned too.

Around the same time, an epidemic of epilepsy broke out in Lakhimur Kheri district in Uttar Pradesh. Around 250 people suffered from sudden convulsive seizures that racked the body. They complained of whistling noises in the ears, saw flashes of coloured lights and suffered from giddiness and headache. Reason: farmers in this area had been ignorantly using BHC to preserve their foodgrain.

For the mass of Indians, however, the threat from imbibing small doses of pesticides in their daily bread is more difficult to quantify. The problem is that these pesticides poison the body slowly. Most of them are made by rearranging atoms of various elements like carbon, hydrogen and chlorine into toxic molecules. These usually attack the nervous systems of the pests, first paralysing and then killing them.

When humans swallow chemicals like DDT and BHC, they are absorbed by the small intestine. These then adhere to the fatty tissues the storehouses of energy that are distributed throughout the body and account for 10 percent of its weight. The toxins usually pile up in the fatty tissues of such vital organs as the thyroid, heart, kidney, liver, the mammary glands and the testes. They can be transferred from the umbilical cord to the growing foetus. And through breast feeding to babies. Over the years, the body can store about 50 to 100 milligrams of a wide variety of these toxins.

The debilitating impact of such a heavy load of toxins came through when the King George Medical College (KGMC) and the Industrial Toxicology Research Centre (ITRC) in Lucknow did a series of tests on workers spraying DDT and malathion regularly. At least half of the workers developed psychological symptoms like anxiety, sleep disturbance and depression. Many complained of severe headaches. One out of five of them had impaired memory and performed simple drawing tests clumsily. Some of them even suffered from retinal damage, blurted vision and saw flashes of light and black dots in front of their eyes.

In Hyderabad, when researchers studied women having still-births they found a high amount of DDT and BHC pesticide residues in their blood. The chilling conclusion: these residues may inhibit normal pregnancy. More recently, an analysis of breast tumours by the Marathwada Agricultural University in Parbhani, Maharashtra showed that almost all of them contained a high content of DDT and BHC in the tissues.

"What we are seeing is the tip of the poisonous Iceberg. And even that seems serious enough for us to sit up and take corrective action", says eminent toxicologist Dr. C. R. Krishna Murthy, chairman of the Scientific Commission probing the Bhopal gas tragedy. He points out that there are other contaminants that pose an equal threat to Indians, but fewer studies have been done on these.

Those colourful jalebis, barfis and gulabjamuns, for instance, are not as sweet as they look. Many of those brightly coloured dyes are made from harmful compounds that are known to cause kidney damage, eye defects and in some cases even affect the reproductive systems. A recent survey by the government-funded ITRC found a third of the samples analysed to be coloured with prohibited dyes. Among the most commonly misused dyes were even added to spices like turmeric and chilli powder.

Nor is the 'sarson ka tel' (mustard oil), widely used for cooking, all that safe. An extensive survey in Uttar Pradesh recently found that in a fourth of the samples, the oil had been adulterated with linseed and the highly toxic argemone oil. Argemone poisoning causes swelling of limbs, nerve damage, heart attacks and blindness. It's a common problem in West Bengal, Maharashtra, Andhra Pradesh and Uttar Pradesh.

If all this isn't enough, a new danger to Indians comes from heavy metals like lead, cadmium, manganese and nickel. In March the results of an

all-India survey found that, the level of these metals in food samples had crossed the safety limits. And what's more, drinking water too was similarly contaminated.

Pesticides (some contain these metals) are only one of the suspects. Untreated industrial effluents being discharged indiscriminately into rivers and fields are major culprits. The other, surprisingly, is the exhaust fumes spewed out by the surfeit of automobiles. These fumes are known to contain high amounts of lead and manganese. Apart from poisoning the air, these settle on food and water sources. Each of these metals if consumed beyond tolerance levels can cause mental retardation in children, nerve damage,impotence, blindness and even death.

Other dangers remain in areas of darkness. No one really knows, for instance, whether the wide-spread use of plastics to pack food products like milk is really safe. Or whether the host of preservatives and additives used in the growing instant food industry is harmful or not.

In agriculture, the chemical war began when high yielding variety crops were introduced in the 60's. These were more vulnerable to pest attacks. **Currently pesticides are sprayed on around 80 million hectares of crops or half of the country's area under cultivation.**

The result: pesticide consumption has risen tenfold in just three decades and is expected to cross 80,000 tonnes this year. India is now both the largest manufacturer as well as consumer of pesticides in South Asia. There are over 131 different types of pesticides marketed under 203 different formulation by over 350 companies in the country and as Dr. Mehrotra puts it: "The Government is the largest peddler of this dope". The Public Sector Hindustan Insecticides manufactures all the DDT the country uses. Along with another Public Sector

CEREALS

Repeated surveys have shown that wheat, rice and maize, the daily diet of most Indians, are highly contaminated with pesticides like DDT and BHC. While levels in rice tend to be lower because of dehusking, in wheat, these pesticides don't degrade even when the flour is made into chappatis. The various dals also contain toxic residues, but the levels are not as high.

VEGETABLES

Malpractices abound. Farmers are known to spray methyl parathion on cauliflower to give it an extra white appearance. Bhindi (okra) is dipped in copper sulphate to make it look greener. And the norm that no spraying should be done a week before harvest is frequently violated. A thorough wash and a vinegard douse help to get rid of much of the toxins in vegetables.

FRUIT

Grapes are probably one of the most widely-sprayed fruits. Studies have shown that they contain high residue level of several pesticides. A good wash with a dash of detergent or baking soda can knock out these toxins. In apples, the threat comes from the chemical daminozide, used as a growth regulator, and now suspected to be cancer-causing. Citrus fruit too contains toxic residues.

MILK & MILK PRODUCTS

Experts feel that the real threat comes from milk and its products like butter, ghee and cheese. Since pesticides adhere to fatty tissues in the body, milk, which has a high content of fat, is an ideal storehouse for toxins. In bovine milk, contamination comes through the cattle fodder which has a high level of toxins. When milk is processed into butter, residue levels get magnified.

MEAT, FISH & EGGS

Non-vegetarian food too is highly contaminated. Goats swallow pesticides when they graze near fields being sprayed with them. Hens do the same through the feed they eat,which is usually the husk of grain. And the residues seep into eggs as well.Fish too contain high amounts of DDT residues. In West Bengal, people illegally spray endosulfan on water to stun fish and catch them.

SWEETS

All those colourful jalebis, barfis and toffees are not as sweet as they look. A study in Uttar Pradesh found that in a third of the samples, the dyes used to colour the sweets were on the Government's prohibited list. Animal studies have shown that these illegal dyes damage the kidneys, spleen and liver and, in some cases, can harm even the re-productive system.

Co., Hindustan Organics, it also accounts for a sixth of the BHC production.

Despite the proliferation of pesticides, DDT and BHC still account for 50,000 tonnes or two-thirds of the total consumption in the country. That's because these are cheaper than most other pesticides, easy to handle and attack a wide range of pests. However, they cause multiple problems. Once sprayed they do not degrade easily and can persist in the environment for as long as 20 years. The soil then becomes a reservoir for these pesticides, steadily transferring them to edible crops, polluting the groundwater, trees and wildlife.

It was not till the 80s that the insidious threat from the explosion of pesticides started coming home. In 1984, a multi-centre study sponsored by the UN Food and Agriculture Organisation (FAO), analysed as many as 1,500 samples of cereals, pulses, milk, oil and meat from different parts of the country. The finding: almost all samples were contaminated with DDT and BHC.

Even more worrying : in as many as 25% of the samples, residue levels had crossed the WHO safety limit. In comparison, similar 'market basket' surveys done in developed countries showed that barely 1.2% of the food samples had residues above the tolerance levels. "It's clear we have gone miles past the danger zone," says Dr. Rajinder Kalra, project coordinator of the FAO study and senior toxicologist at the Punjab Agriculture University in Ludhiana.

Indian food is laced with some of the highest amounts of toxic pesticide residues in the world.

Proof that those high levels of pesticides were finding their way into the body tissues came just as the FAO study was being completed. Under the Global Environment Monitoring Programme sponsored by the UN, India was among the10 nations chosen for studying pesticide residues in human breast milk. Breast milk, because of its high content, is one of the best indicators of pesticide build-up in the body.

Indian findings were scary. Milk taken from 50 lactating women had DDT and BHC residue at least four times higher than in the other participating countries. Only milk taken from Chinese women had higher residues. **Worse, Indian babies, & along with Chinese, were imbibing at least eight times more DDT than breast-fed German, American and Swedish babies.** "Our babies are now taking three times more than the acceptable daily limits for these pesticides and nothing is known about its impact on their health" says Krishna Murti.

Developed countries suffered from the same kind of laxity till 1962 when US genetic biologist Rachel Carson wrote Silent Spring - an epoch-making book that exposed the havoc being created by pesticides. With the massive public outcry against pesticides building up, these countries were forced to act on the large amount of studies on the harm caused by these chemicals.

DDT and BHC, widely used in India, have been banned in at least 16 countries.

With DDT, for instance, tests on animals showed evidence of its being a carcinogen and causing chromosomal changes. In the US, it was feared that the bald eagle, the national emblem, was becoming extinct because of widespread spraying of DDT on its habitat. It seemed to inhibit the reproductive ability of the bird. In humans, DDT .was also associated with nerve and brain damage. Animal studies showed clear evidence of its being a carcinogen apart from causing spontaneous abortions and leading to severe liver and kidney damage. And these are just a few of its ill effects.

That kind of damning evidence saw seven countries including the USSR, the US and West Germany ban DDT in the 70s. And nine other countries put severe restirctions on its use. BHC too has been banned in nine countries in North America and Europe and its use severely restricted in 13 countries.

In several states, farmers violate the rule that no spraying should be done a week before harvest to prevent high pesticide residues in vegetables. That has seen residue levels shoot up to dangerous levels in such vegetables as okra, tomatoes, cabbage and cauliflower.

Apart from high buildup in food products, that kind of misuse has led to other problems. The most serious being the rising resistance among pests. For instance, the bollworm has developed resistance to several pesticides. Spraying has now gone up in many states from seven times a crop to over 30. And the widespread use of DDT by the Health Ministry has seen four species of mosquitoes develop resistance to the chemicals.

Summing up the situation, Shekar Singh of

Kalpavriksh, a voluntary Organisation working on the pesticide problem, says: "There seems to be everything going wrong at each stage. There is no proper regulation of pesticides, there is no check on the buildup of residues in our footstuffs and I'm afraid there is absolutely no public consciousness at all."

Prodded by the growing evidence of the chemical menace, the Union Government in 1984 decided to appoint an expert committee to review usage of pesticides like DDT and BHC. After assessing a whole body of data on DDT, the committee concluded in 1985 that it may continue to be used in the health programme but be banned in agriculture.

The guiding reason, however, was not safety but economics. Agriculture now relies more on BHC and uses barely 400 tonnes or 4% of the country's DDT production. But the Health Ministry said it just could not afford to stop using DDT. It pointed out that the cost of covering a population of I million would shoot up from Rs. 33 lakh to Rs. 195 lakh if malathion, a relatively safer pesticide was used instead of DDT.

That meant that there was going to be no let-up on the poison explosion. The Health Ministry itself projects that by 1999 it needs 20,000 tonnes of DDT annually for its spraying programme. And with the Ministry continuing to spray DDT, residues will keep finding their way into the soil and edible crops. That fact came through when the Punjab Agriculture University recently proved that spraying of DDT around households resulted in residue levels shooting up in stored grain like wheat and rice.

Meanwhile, the Agriculture Ministry used the same economic argument to allow farmers to continue using BHC. The committee, which filed its report on BHC in 1986, made it clear that production of the pesticide should be frozen. It also wants the government to ban its spraying on vegetables, oilseed crops and in storage godowns. The Government has acted on these instructions though belatedly. BHC production was frozen at its current installed capacity of 41,900 tonnes last year. But farmers were only 'advised' not to use it on vegetables and oilseeds.

Orders for banning DDT's use in agriculture are to be issued only next fortnight - four years after the expert committees's recommendation.

—Raj Chengappa with Chidanand Rajghatta

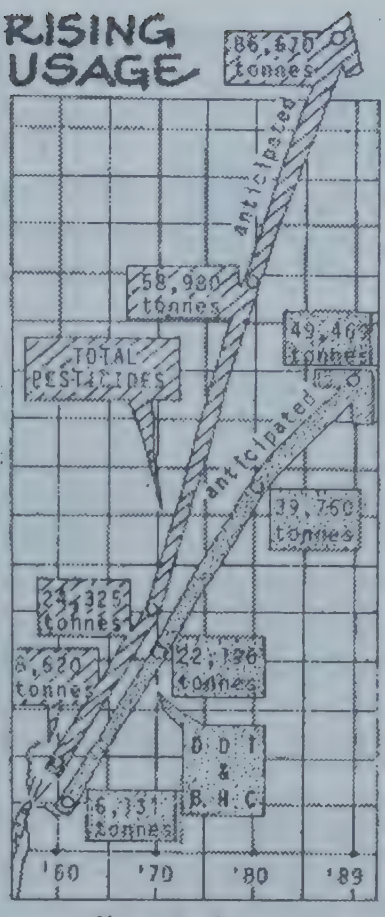


Chart by B.K. SHARMA

Apple, the Forbidden Fruit and Grapes that are Sour

• An apple a day keeps the doctor away? No not anymore, for sure. Thanks to pesticides, they have become a serious health hazard. In America, as it was in Adam's paradise, apples are forbidden fruit. Owners of apple orchards are frantic as they see mounds of the fruit rotting in their backyards. But their feelings are euphoric compared to the bitterness in Chile whose fruits have been banned in the U.S. because a terrorist put cyanide in two Chileangrapes and announced his deed. Now all fruits from 'that country are banned and stores even carry notices assuring their customers that no Chilean fruits are sold in them. The economic consequence for Chile have been disastrous.

Nearer home we too face the threat of poisoned fruit, one of the spin-offs of the progress of science. To make mangoes and bananas ripen fast, a carcinogenic Carbide powder is dusted over them, and there is no way a buyer can make out whether the mangoes he is buying have ripened naturally or by courtesy of the chemical. Of course, there is a law against it, but, like other laws,it is never enforced.

—Mirror, May '89.

World's Changing Food Scenario

Major changes are taking place in the world's food scenario that could have far-reaching consequences for the future of humankind. Modern ways of producing and distributing food are resulting in serious problems. In the USA, this has led to a big scare, which formed the lead story of *Newsweek*'s March 27, 1989, issue under the title "WARNING". Your food, nutritious and delicious, may be 'hazardous to your health'. The Newsweek article reported this latest development on the US food front in the following words:

"Americans take for granted the spectacular bounty of choice meats, fish and vegetables that fill their markets. Or they used to. The plenty is still there. But is that shiny red apple actually a container of carcinogens? And was that firm, juicy chicken fed seed contaminated with a pesticide banned a decade ago? Or those grapes: were those soft ones on the stem dented by a ham-handed stock clerk, or a clumsy cyanide lacing?

"For weeks now, fresh food and fresh questions have been delivered to the nation's pantry. The result is a stew of confusion. Government regulators and critics alike have questioned the safety of apples, beef, chicken, eggs, fish, milk, pork and popcorn. Alone, each could be evaluated and in some cases dismissed. Together they appeared to be cause for worry about the quality of America's abundant food supply."

The result of this panic has been a major switch in the way many Americans think about food. They are abandoning their preference for the products of modern farming, and are instead clamouring for food that is produced the organic or natural way. An accompanying *Newsweek* report spoke of this new trend in the following way:

"The organic-food business was going bananas last week with distributors, store managers and shoppers clamoring for fruits and vegetables grown close to nature". "Produce brokers have been on the phone calling every organic farmer they know: "What do you have? How much do you have? When can I get it?" says George Devault, editor of The New Farm Magazine. 'They're desperate. And of course organic apples and apple juice are worth their weight in gold". Even organic apples from the super- market made some consumers nervous. Rhonda Kravitz, a Highland Park, Illinois nurse, with a new baby, shopped last week at Green Earth Natural Foods, where prices are high but where she knows she can trust the labels, 'It's worth it, just for the peace of mind," she says.

These trends towards organic farming, and away from modern farming, should not come as a surprise to anyone who has been keeping a watch on the situation. Modern methods of agriculture have been beset with a variety of problems, and it is being slowly realized that it is not the unmixed blessing it was once assumed to be. Specifically, the following five disturbing trends are leading to a situation whereby modern agriculture's claim to supply our food needs can be threatened in a major way:

Rising Costs: The cost of inputs has been skyrocketing, but their effectiveness diminishing. For example, the cost of developing a new pesticide has shot up nearly 40 times between 1956 and 1984. The price the consumer has to pay for it has risen even more sharply — in the USA, one kilogram of DDT used to cost only 40 cents in the 1950s and 1960s, but the new pesticides are being sold at rates ranging from $90 to $900 a kg. The situation is much worse in countries like India, for the know-how has to be imported and consequently we are at the mercy of multinationals and others who own the patents.

Pesticide Resistance: One may imagine that the higher costs of newly developed inputs means better effectiveness, for they represent more advanced technologies. But in most cases the fact of the matter is just the opposite. This paradox is evident from the fact that a growing number of insect species have become resistant to our pesticides. In 1935, only seven insect species refused to run away or die when chemicals were sprayed, but by 1986, despite the development of far more potent and poisonous

pesticides, this number has gone up to 462.

It is evident that while we have been engaged in research aimed at discovering more powerful pesticides, the insects have also been furiously engaged in research of their own! Unlike in the case of cars or satellites or computers, our "advanced' technologies in agriculture represent a game with other living organisms, which often emerge victorious in the long run. We thus get caught up in an ever increasing spiral of new technologies merely to take care of the diminishing effectiveness of the earlier ones.

Ruining the land : Excessive erosion of top soil as a result of modern farming techniques poses a grave threat to land productivity. This problem is more acute in countries like India where nature's original endowments have been more generous. So, instead of preserving and building on those endowments, we are depicting them in the name of "higher output" from land. In some areas where modern farming techniques have been used more intensively—e.g., some portions of the US and USSR, and even some third world countries like the Philippines— the first signs of desertification are already beginning to appear. Conversion of fertile lands into desert may turn out to be the most disastrous consequence of the green revolution.

Water Depletion: Wherever modern farming has been introduced, there has been an alarming fall in the ground water level. For example, in Bijnor district of U.P., the water level was between 10 and 15ft. in 1970, but since then (with the onset of modern farming methods for sugarcane cultivation) it has dropped to 42ft.

Poisoned Food: While the quantity of food production may have gone up as a result of the green revolution, the quality has definitely gone down. In fact, recent medical research has directly traced several human health problems to the use of pesticides, particularly in tropical countries like Bangladesh.

All these factors should make us sit up and re-evaluate our approach to farming. In a country, like India, the majority of farmers still produce food the traditional organic way. Right now, in the name of development and progress, we are trying our best to persuade them to switchover to chemicals, fertiliers and pesticides. We are subsidizing these inputs in a big way, under the assumption that this is a useful investment from the long-term point of view. But is this assumption really correct? Would we not be better off to learn from the mistakes of the so-called advanced countries, and teach our farmers not to fall into the lure of these modern methods?

—T.S. Ananthu

(T. S. Ananthu was a Research Fellow at the Gandhi Peace Foundation, New Delhi. He was also associated with the Mohanpur Experiment in Natural Farming. Extracts from a report co-authored by him are included in this magazine).

• *The land does not ask for flowers while the belly lacks rice*

- Indian Proverb

For Poison-Free Food

(A proposal for co-operative self-help)

Some of you may have read 'Poison in Your Food', the lead feature carried by *India Today* in their issue dated June 15, 1989. While we are bothered about all sorts of things, the gross irony is that the food we eat is now the greatest single threat to our health. This is particularly true of all urban areas. The exception may be Calcutta, where perhaps the air is more toxic than the food.

The 'slow poisoning' to which we are exposing ourselves and our kids, no longer seems slow. It's not just the future we have to worry about. The crisis is already here, and worsening each year.

But what can be done? Do we resign ourselves to what we get and try to make a brave show of it, or do we have a choice? To all those who say they are concerned, this proposal suggests: Put your money/brains/time where your mouth is. It's high time we try to "walk our talk". As it is, everyone spends some money and time on food. So, may be, we can spend it more wisely on food that is free of toxic chemicals.

There are many benefits to co-operative initiative which individual efforts cannot match. This provided members fulfil their minimum agreed obligations to the cause of the group. It is on this assumption that an informal co-operative to provide ourselves organic/natural food, is proposed to be started.

The immediate strategy will be to identify sources that can supply various chemical-free foodstuffs. (A few are already known). This may be followed up with arrangements for collective purchase, according to needs and availability. We hope to buy organic perishables like vegetables and fruits on a weekly basis, and non-perishables like whole grains/legumes, etc. on a monthly basis. In the case of perishables, it is proposed to share the expenses for one person to take a trip out of the city for purchases every Saturday or Sunday.

At a later stage, the group may consider starting a farm-city link with organic/natural farmers for mutual support. A co-operative vegetable garden may also be considered at any suitable site that may become available.

The group will function on the basis of collective responsibility and 2-hour meetings will be held on every first Sunday of each month. The inaugural meeting is being restricted to 20 people. To register, please give in your name, address and seed capital advance of Rs 100/- per family/ individual. Your written suggestions are also welcome.

—Kavita & Vinita
BOMBAY

THE ORGANIC ADVANTAGE

Organicfood.co.uk suggest **5** top reasons to go natural
(and there may be many,many more)

Organic produce is not laced with a cocktail of poisonous chemicals. On the other hand, an average conventionally-grown apple has 20-30 artificial poisons on its skin, even after rinsing.

Growing organic is the only practical way to avoid eating genetically modified (GM) food. And when you buy organic food, you register your mistrust of and protest against GM farming. Few countries actually want GM food because they know that Monsanto's most successful product is mustard gas! And the biggest departments in all GM corporations are working on terminator technology. This means that farmers will not be forced to buy new seeds from their crops but will be forced to buy new seeds from the GM corporations every season. And most farmers cannot afford to get into that cycle, which is why Indian farmers demonstrated before the Monsanto and Zeneca head offices last year.

Intensively reared daily cows and farm animals are fed a dangerous cocktail of antibiotics, hormones, antiparasite drugs and many other medicines on a regular basis, whether they are ill or not. These drugs are passed directly onto the consumers of their dairy produce or meat, which must be a contributing factor of meat-related diseases like high blood pressure. So if you thrive on dairy or meat products, going organic is perhaps the best option.

Fresh organic produce contains, on an average, 50 per cent more vitamins, minerals, enzymes and other micro-nutrients than intensively farmed produce.

Organic produce simply tastes so much better. Fruit and vegetables full of juice and flavour, and so many different varieties to try !

Eating organic soups could help reduce the risk of developing cancer or suffering a stroke or heart attack, *New Scientist* magazine reported recently. Researchers have discovered that organic varieties of soup have almost six times as much salicylic acid, which helps to prevent hardening of the arteries and bowel cancer, as regular soup. Scientists at the Scotland's University of Strathclyde analysed 11 brands of organic soup and compared the levels of salicylic acid with amounts in non-organic varieties. They found the highest levels in an organic carrot and coriander soup and said the amounts were nearly undetectable in some traditional brands. Britain's Soil Association, which promotes organic farming, said the new research added to the body of evidence indicating the health benefits of organic food. "Previously, two independent studies have shown organic crops to contain higher levels of vitamin-C, calcium, magnesium and iron, as well as other minerals," said Patrick Holden, the director of the association.

Healthier, tastier and costilier

For the first time a new brand of organic food is all set to hit the domestic market in a big way. Sharmistha Choudhury on the diet that is hugely in all over the world

Danger lurks, as health freaks are well aware, not only in scoops of the more mouth watering varieties of junk food, but also in the freshest, greenest vegetables, the creamiest cup of cow's milk or even in that just-plucked fruit.

Which is why organic food is hugely in all over the world. As a matter of fact, so popular does organic-diet-look set to become in the coming years that the Khadi and Village Industries Commission (KVIC) has just announced the launch of Desi Aahaar, its own brand of organic foods. Most of the organic food now produced in the country is either exported or sold in small quantities in a few select shops.

Available at a number of Khadi Gramodyog outlets in Delhi right now, Desi Aahaar will be launched in other major metros by October this year. Produced exclusively for the domestic market, this brand of organic food includes cereals (wheat porridge and basmati rice), pulses (arhar, toor, urad, chana, rajma),spices (turmeric, coriander, chilli) and jaggery. Needless to say, it is fabulously expensive and KVIC products will cost about 30-50 per cent more than the standard price of such items. Of course, the steep price tag has its justification. Organic produce, since it is grown without the use of any synthetic pesticides or insecticides, is more labour- intensive. Also, very often the yields of an organically grown product are significantly lower than that grown under non-organic conditions. The time-to-time certification, use of expensive sprays, training of agriculturists for organic practice etc., all contribute to the high rates. But for purists, who can afford the extra cost, organic food, with its health benefits, is like manna from heaven.

Free of toxic chemicals

Organic foods are health foods grown without the use of synthetic / chemical treatments. The word 'organic' describes a system of farming and processing which follows standards that are then documented by certification agencies (for instance, KVIC has procured material from farms which have been certified by international agencies like the France-based International Federation of Organic Agriculture Movements). Organic growers cannot apply the toxic pesticides used in most conventional agriculture and may not grow genetically engineered crops. The use of hormones, antibiotics and steroids are banned from organic livestock, dairy and poultry production.

Reading thus far, are you convinced that organic food is laden with pests and insects which are simply allowed to flourish? Relax. Though not sprayed with the regular chemical insecticides and pesticides, organic produce is indeed treated with certified biological sprays which are natural and animal or plant-based. And the quantity or the dose of these natural sprays is

also controlled to prevent even a minimum deposit of residues on the food.

Beware of the fake stuff

There is no legal definition of what constitutes organic food. Which is why, health food centres often claim that their products are organic. Beware. Even if chemicals or insecticides or pesticides haven't been used on the foodstuff, that in itself isn't enough to label it organic.

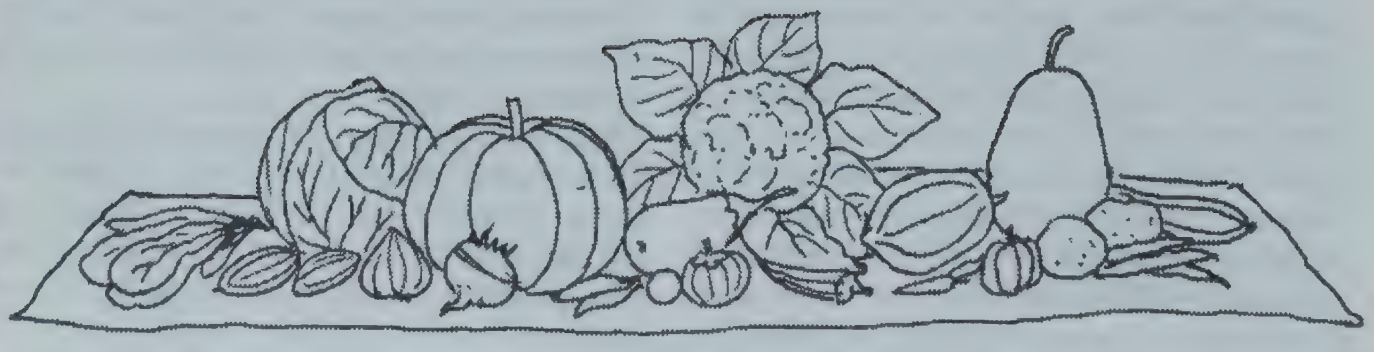
According to Organic Food Production, UK, an 'organic' product must use 95 per cent or more of organic agricultural ingredients. The organic content is always expressed as a proportion of the total content of agriculturally derived ingredients. If a product has between 70 per cent and 95 per cent of its agricultural composition as organic, it is not possible to call it organic, although the label can say "X per cent of the agricultural ingredients were produced in accordance with the rules of organic production".

Safer than the rest

Organic food is supposed to be healthier. But 'healthier' does not necessarily mean 'more nutritious', but simply 'safer for human consumption', claim a group of experts. Growing food organically doesn't alter its nutritional content but the lack of pesticidal residues on organic food makes it safer. However, even the most carefully grown organic products may get contaminated from residues imbibed from the soil from previous farming practices or from contaminated water supplies, they warn.

Some research, however, indicates that organic does indeed stand for better quality food. A 2001 statistical analysis in the Journal of Alternative and Complementary Medicine evaluated 41 studies that compared the nutritional aspects of organic and conventionally farmed fruits and vegetables. It showed that on average the organic produce had 27 per cent more vitamin-C, 21 per cent more iron, 29 per cent more magnesium and 14 per cent more phosphorus. Synthetic chemicals, claim green crusaders, not only disturb the ecological balance, but by polluting the air and water, give rise to crop diseases which are resistant to even chemical pesticidal treatments. Hence, they too vote for the eco-friendly organic food.

Source : *The Telegraph*, 06.05.'02



OF MICE AND FOOD FOR MEN

DEVINDER SHARMA

The first genetically modified food product for the market was a brand of tomatoes called Flavr Savr. Before being made commercially available, it was fed to laboratory rodents. The rodents refused to eat the tomatoes which contained an alien gene. When force-fed, the rodents fell sick. Flavr Savr was a commercial disaster.

Since then, industrialized countries, mainly the United States of America, have made numerous GM food products commercially available. Ably backed by its powerful propaganda machinery it has announced that these "novel foods" are no different from conventional foods. Joining the chorus are agricultural scientists, the media, bureaucrats and politicians. All desperately looking for financial support to survive in an era of fast-shrinking public funding.

Such is the desperation of these sections that any voice that could restrict their funds is met with hostility. This was seen when the British scientist, Arpad Pusztai, reported that rats fed with GM potatoes showed damage to the kidney thymus, spleen and gut. Pusztai lost his job and soon became a persona non grata in the scientific community. Several other researchers have suffered as well.

Experiment with truth

While the international scientific community spares no effort to boost the sagging fortunes of the biotech industry by giving a clean chit to GM food, the simple experiments of a Dutch undergraduate, Hinze Hogendoorm, prove otherwise. Hogendoorm picked up 30 female mice from a herpetology centre. He bought some rodent mix and Kellogg's and Quaker's cereals and oatmeal that was specified to be "GM-free". This formed the staple diet for the mice. For GM food, he used maize and soya.

The mice were let loose in big cages with the two piles of GM and non-GM food stacked in four bowls. The mice—obviously un-aware of the virtues of GM "functional foods" - gave their verdict. They emptied the bowls containing the non-GM food, whereas the bowls with GM food remained un-touched.

Hogendoorm was still not satisfied. He conducted a few more tests to find out what happens when the mice are force-fed with GM food. Significantly. one mouse, which was fed with GM food, died for unknown reasons. While the others, which were put on a GM diet, initially looked heavy but by the end of the experiment actually lost weight. The rival group of mice, which was on a non-GM diet, ate less and gained more weight, and continued to gain weight.

Keep children away

Equally worrisome were the behavioural changes that the diet had induced in the mice during the experiments. The mice on the GM diet seemed less active and more nervous and distressed. "Many were running round and round the basket, scrabbling desperately in the sawdust, and even frantically jumping up the sides, something I'd never seen before," said Hogendoorm.

The Royal Society, however has refrained from commenting on Hogendoorm's experiments. To restore its credentials, it released a report on GM plants for food use and human health in the first week of February. Under pressure from British and European consumers who continue to question the scientific claims on food safety, the Royal Society has called for tougher regulations before GM food is marked as "safe for human consumption". As a face-saving device, it has drawn attention to the potential risks for babies who are more susceptible to changes in the nutritional make-up of the food they eat. By suggesting that GM DNA has no ill-effects on human health, and at the same time pointing to the potential threat to babies' health, the report shows how contradictory the views are within the scientific community itself on GM food. One wonders what the Royal Society would now advise the British prime minister, Tony Blair, who has publicly gone on record saying that he finds GM food safe for his children. With the Royal Society proving him wrong, Blair should direct all British High Commission offices to refrain from issuing press releases stating that GM food is safe for human and child consumption.

Source : *The Telegraph*, 27.2.'02

The Kitchen Garden Revolution

> Every revolution was once a mere thought in the mind.
>
> - Emerson

In the early seventies, V.V. Giri, the erstwhile President of India, called upon families to grow small vegetable gardens in whatever space available to them near their homes. This was then the subject of many jokes among my college friends, digging fun at the old man and his quaint ideas.

At that time, industrial growth was still the rising god of the day, and we believed that the industrial approach should be applied to agriculture as well. I remember asking my economics professor whether India should not primarily concentrate on setting up agro-industries to support the 'poor', farming families that constituted the bulk of our population. Most of us were under the ignorant illusion that the country could enjoy wind-fall gains through the 'green-revolution' package of hybrid seeds, chemical fertilisers and pesticides, sophisticated irrigation and large-scale mechanized operations. We did not realise that agro-industry mainly encouraged and supported the production of cash-crop monocultures which could then be exported for urban consumption. We did not know that the local nutrition needs would greatly suffer. And we had no understanding that such continuous export of organic matter would cause a fundamental impoverishment of rural areas by disrupting the natural regeneration of fertility via local consumption and local recycling of all organic waste to the land.

Today, the 'green-revolution' or chemical-based method of farming stands thoroughly discredited. The many serious problems engendered by this short-sighted approach are raising their ugly heads and demanding urgent consideration. [Refer: 'Green-Revolution-Menace!]. But what are the 'ecological alternatives'?

Small-scale kitchen gardens for family consumption now seem a vital corner-stone of a more sustainable alternate strategy which can meet a major part of local nutrition needs without disturbing the ecological balance of nature.

There are many sound reasons going for the intensive raising of small home gardens. The foremost reason, of course, is an assured supply of poison-free vegetables which are a rapidly disappearing species. Grains and dals have a longer storage life. But vegetables, being perishable, should best be grown as close as possible to the site of consumption. Kitchen gardens, as a basic step towards self-help, also significantly ease the pressure on traditional croplands. Money savings for the family and energy savings in avoiding wasteful transportation are other obvious benefits.

The proximity of the vegetable to the home enables easy recycling of kitchen waste, e.g. the peelings from vegetables and fruits, used tea-

leaves, kitchen leftovers, ... in fact, most organic waste. These are an excellent mulch for restoring the fertility of the soil, and for aiding moisture retention and aeration. Some prefer to compost the organic waste before returning to the soil as a concentrated organic fertilizer. All such strategies for re-cycling the fertility of the land can fetch an excellent yield of fresh greens from a small area. Conversely, without returning the produce of the earth where it belongs, we not only cause progressive degeneration of the soil, but the wasted resource - often dumped as untreated sewage in our rivers - then becomes a pollutant as well.

A kitchen garden near the home has convenient access for watering and harvesting. In dry areas, the water used for domestic purposes is also easily re-cycled to the plants. The vegetation purifies the air and cools the environment. The greenery offers an aesthetic setting that is soothing to the nerves. And by actively participating in the cycle of regeneration, there is a creative satisfaction that few activities can match.

The educational benefits of a kitchen garden, for young and old alike, are tremendous. Most people think of ecology in dry, academic terms. A kitchen garden provides a unique opportunity for understanding the practical aspects of this concept, which is rapidly becoming the central global concern of our times. The planting and observation of kitchen gardens by one or more locally appropriate methods can also be very usefully integrated in the educational fun activities of any school, so that our children do not unwittingly grow up like us to become ecological parasites on the land.

Alternative Methods of Kitchen Gardening

Apart from the traditional way of tilling the land and adding manure, (usually cowdung), there are at least half a dozen alternative methods of growing vegetables without the use of chemicals. Sir Albert Howard's strategy of organic gardening (Ref.: An Agricultural Testament - by A. Howard) uses compost for preparing vegetable beds. The Bio-dynamic and the French Intensive Bio-dynamic approaches have their own methods of preparing and applying compost in specially prepared beds. These later variations in organic gardening using compost, are well documented in : (i) 'How to Grow more Vegetables' - by John Jeevons, (ii) 'The Enchanted Garden' (Alin Chadwick's Intensive Bio-Dynamic method) - by Tom Cuthbertson, and many other illustrated books on the subject. The Mazibuko Deep Pit method (Refer: 'F.A.R.M. - Dr. Shirin Gadhia's way), and the strategy of alley cropping alongside rows of leguminous trees are yet other approaches for growing vegetables through biological regeneration of the soil.

Fukuoka's strategy of natural farming is the simplest of all, and also requires the least labour. No compost is used, no tilling done, and no beds are prepared. All that is required is protecting the land from intruders (particularly cattle), and directly broadcasting an assortment of vegetable and leguminous seeds among the weeds. Fukuoka speaks highly of the Daikon (or giant white radish) as a natural tiller and pioneering re-generator of the land. Weeds are seen as friends that help to keep the soil alive. When weed rampancy is problematic, these are cut and spread back on the land instead of uprooting them by tilling. Sometimes, it is advantageous to simply bend the weeds flat on the ground (without compacting the soil) so that the other plants have a good headstart before the injured weeds begin to recover. The leguminous species planted in the earth also greatly aid in improving the fertility of the land by fixing nitrogen from the atmosphere. In the case of poor soils, there may be little yield in the first 1 or 2 years. Thereafter, as the soil gets regenerated and a variety of vegetation appears, the yield steadily improves. This method is described in more detail in the article 'Rishi Kheti', which documents the experiences of Raju and Shalini Titus at their farm in Hoshangabad.

But perhaps the most versatile among the various strategies of kitchen gardening is the sheet mulch method which can be widely prescribed in a variety of situations. It is not only suitable for poor, eroded soils, and regions, and weed invaded plots, but also works very well in paved urban areas and even roof-tops. The following paragraphs, extracted from permaculture notes and books, cover in considerable detail this sheet mulch method of gardening. Also included are some illustrations for a small roof- top garden designed by Robyn Francis, editor of the International Permaculture Journal.

Small Home Garden by Sheetmulching

Any country, not under ice, is agricultural country.

Forests, of course, are sacred and must be preserved and extended, even though the extensions we catalyse may be a poly cultural afforestation of fruit and leguminous species. But that apart, one cannot overstress the importance of intensive home gardening. In Western countries, home gardens easily outproduce formal agriculture in terms of yield per unit area, and are far more efficient in terms of energy input-output ratio. This is also true in many other parts of the world where domestic organic waste, particularly kitchen left-overs, are returned to the garden.

Now, the first thing to say about sheetmulching is that it saves a great deal of labour, and a great deal of water, while usefully re-cycling material that normally goes into landfill. Mulching produces an excellent soil, and saves money for public authorities. It is suitable to wide range of situations. And it also suppresses all weeds (without sabotaging the erosion-control functions they usually perform).

Method

1) Before starting to lay a sheet mulch garden, select your site and lay out a definite border (curved is better than straight), using rocks or any other locally suitable material, including compacted mud. In weed-prone plots, part of the edge of the garden may be against a paved road or a wall, to guard against the invasion of weeds from the rear.
2) Collect all the material you need, including seeds and perhaps some young plants.
3) Don't bother to dig, level or weed the area. If there, are weeds, just tread these down. In case the growth is thick, the weeds may be slashed and spread on the ground.
   Any other source of weed, seedy hay or like material, may also be spread on the ground before you overlap it with the next layers of sheet mulch so that no weeds follow on.
4) Plant any saplings of trees or shrubs as usual.
5) Wet the ground and sprinkle some manure (chicken manure, blood and bone, cowdung ...). These provide the nitrogen to start the decomposition process of reducing the carbon in the following layers of mulch.
6) Then spread a thin layer (one inch) of any non-noxious organic wastes like the leaves, peelings of vegetables/fruits, any leaves, and small foodscraps. These are scattered first for the worms.
7) Take a lot of paper and/or cardboard, used jute bags, banana leaves, old clothes, etc., and soak them thoroughly. Spread this layer (half inch) on the bed, taking care to overlap well, and allowing no gaps. This totally suppresses the growth of all weeds underneath and also checks the dissipation of moisture from the layers above. If you have a valuable tree or shrub in the way, tear the paper half across and pull it around the stem. Lay another at right angles to the first. Go on, leaving only useful plants with their leaves poking out.
8) A thin layer of peelings, etc. as in (6) above may again be spread on top of the wet paper, alongwith a light sprinkling of any manure or compost (if readily available). This repeated layer of sheet mulch is optional.
9) Top all the layers with 12" (twelve inches) of seed-free straw, and/or rice husk/sawdust, coconut shell fibre, pine or Casuarina needles, or any similar, dry, weed-seed free mulch. Spread loosely, and dampen with watering can. This last layer prevents rapid evaporation of moisture and decomposes into good soil sooner than expected under the onslaught of earthworms and micro-organisms from the lower layers.
10) Having done all this, you are now ready to plant your seeds, seedlings and tubers. If your garden is on concrete (e.g. roof-top) or on a table, it helps to add in some leguminous species like alfalfa or lucerne to facilitate the process of nitrogen-fixation.

Planting Method:

(i) Tubers (e.g.potato):Make a hole through all layers, cut through paper, and place the tuber in a handful of good soil through the hole.
(ii) Seedlings: Part the straw upto 4-5 inches from the top, put in a couple of handfuls of soil in which you plant the seedling.
(iii) Large seeds : Soak seed, put in a soil capsule of about one inch diameter, and place at about 3" to 4" depth into the straw.
(iv) Small seeds : Scatter some good soil, about 2 inches deep on the straw. Soak seeds and sprinkle on soil.

Prefer intensive and mixed planting of species and indigenous varieties over hybrids. The design of the garden (i.e. the mix chosen and the relative positioning of species) may be guided by considerations of beneficial companion planting, edge effect, whether a species is annual or perennial, a hedge plant or creeper, etc. If in doubt, plant at random. The key factors are intensive planting and an assorted variety.

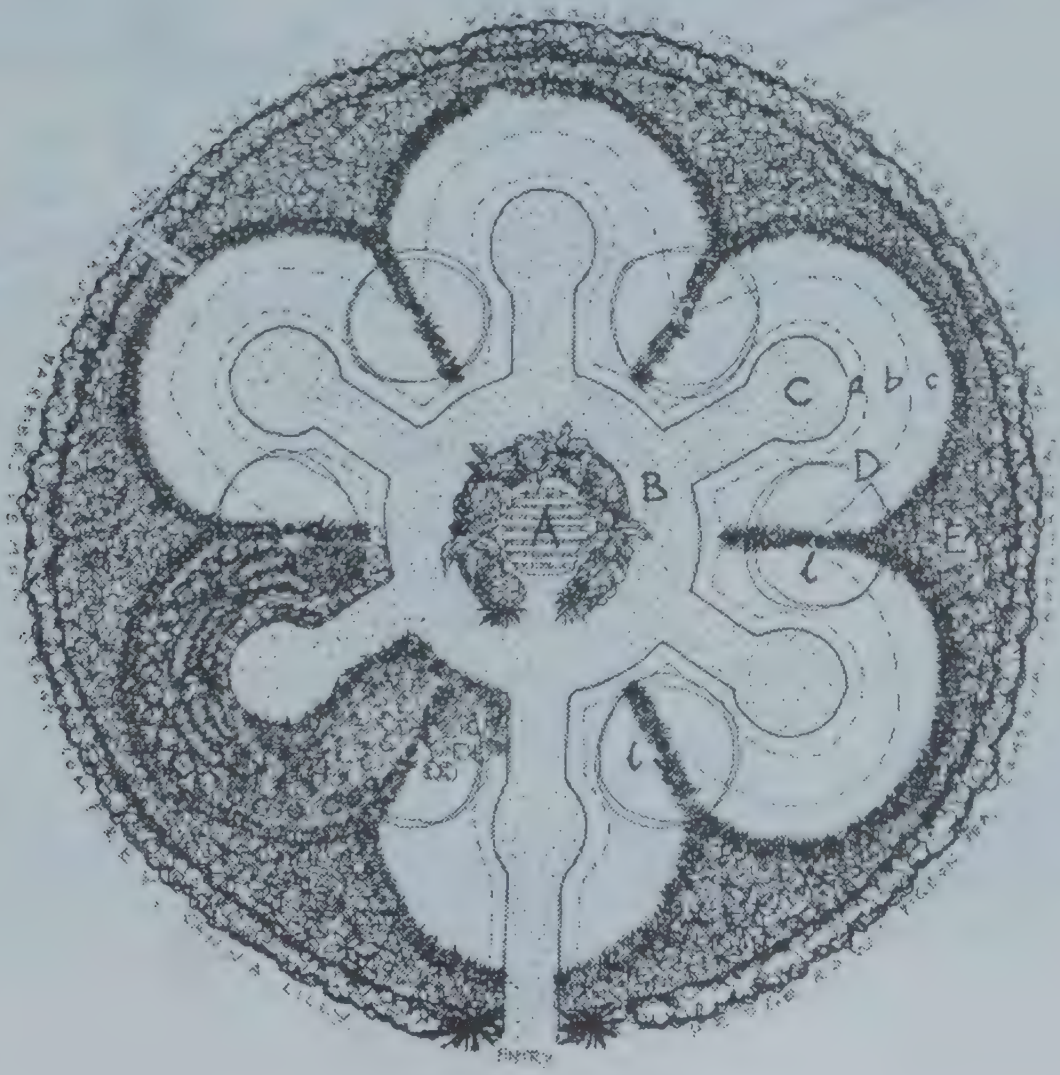
Okay, kitchen garden ready. Just water and sit back, Thereafter, 20 minutes of maintenance per week are adequate. Water only when the plants begin to wilt. When uncertain, feel down in the mulch. If it is damp at base, it doesn't need water.

It takes barely a few months in the tropics for the soil to get revolutionised by this method. Six months later, if you look under the straw, you will find the soil teeming with hundreds of earthworms and micro-organisms. And each year, there will be an improvement in the yield. Initially - there may be a period of pests, but the situation soon stabilises. The first season is not good for the tubers. In the second season, add straw on the top. Repeat this annually. Daily peelings from the kitchen may be tucked under the straw or separately composted in a garbage bin. As your creepers grow, make a trellis for them using anything suitable that is handy, e.g. bamboo strips with rope, wire, or other bamboo strips running between them. Creepers on trellis cut off excess sunlight, check the rate of evaporation, improve the growth of the garden and offer pleasant shade to sit under. With fresh air, clean water and a good home garden, you will never need a doctor.

— Extracts from 'Permaculture Two' and notes from a Permaculture workshop

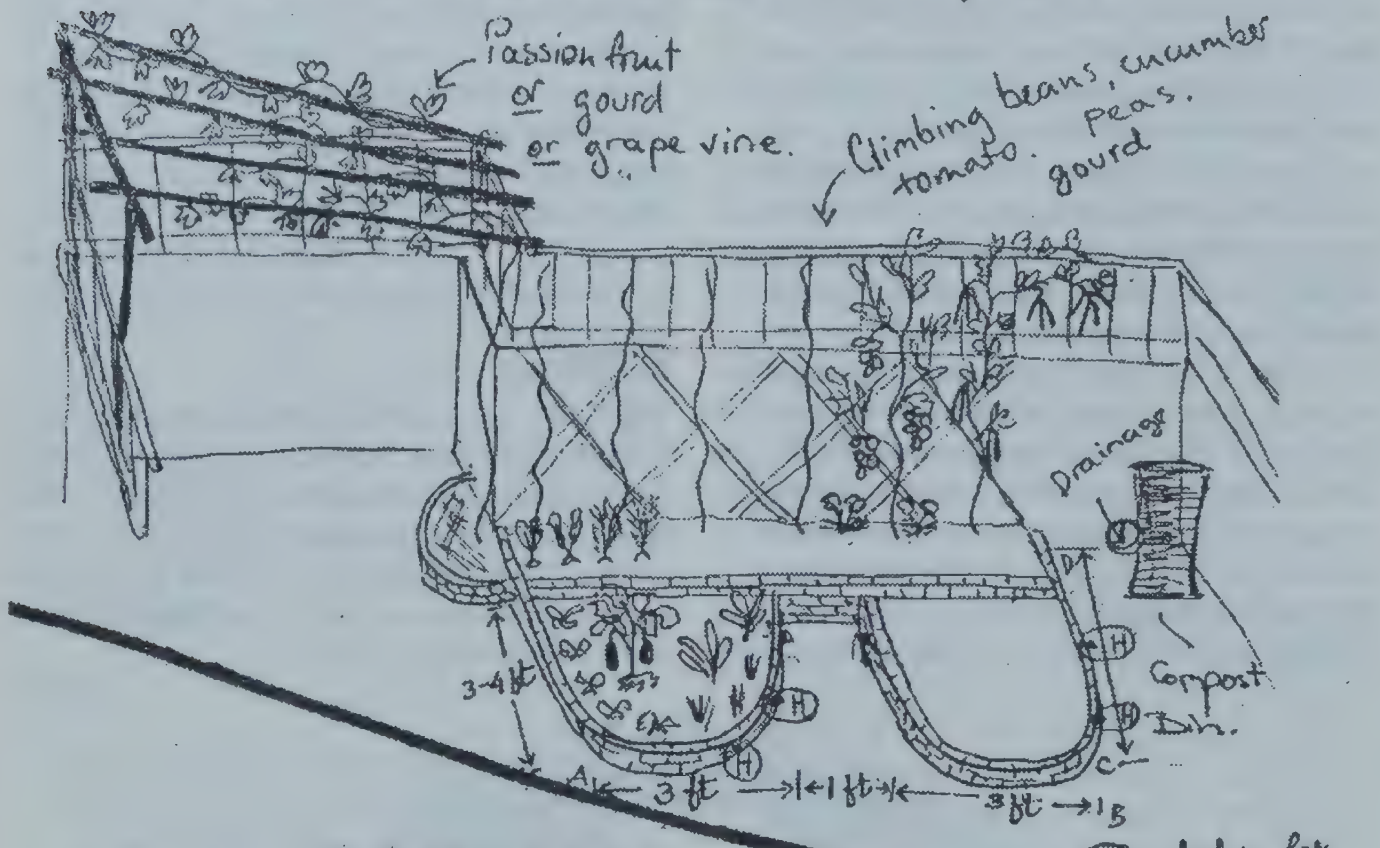
Ed. Note

Yes, it has been tried in India. And it works! Any questions you have, may be directed to Venkat or John Prakash Pereira or Prof. G.S. Aurora. The last mentioned has successfully grown a roof-top kitchen garden in Hyderabad using the sheet mulch method. (Addresses are given in the 'Network Guide' at the back of this publication).

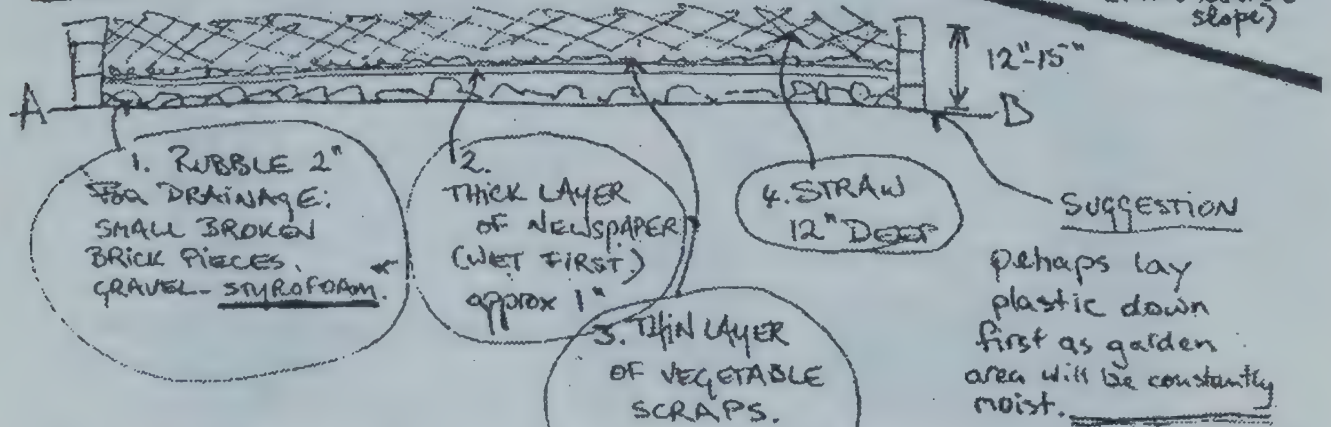


START A ROOF TOP GARDEN!

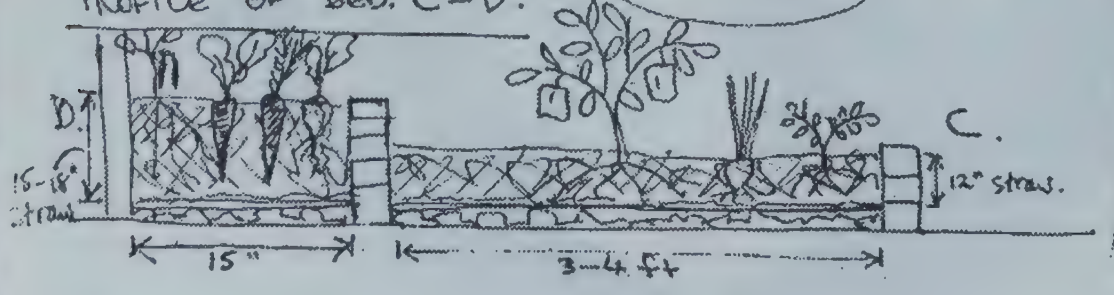
(This small kitchen garden was designed for a roof-top in Bombay by Robyn Francis, Editor of the International Permaculture Journal.)



PROFILE OF BED: A—B.

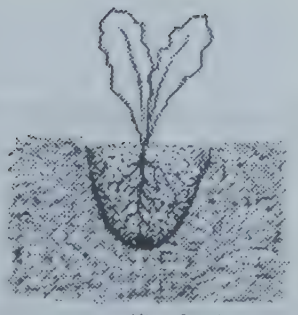

12"-15"
A
B
1. RUBBLE 2" for DRAINAGE: SMALL BROKEN BRICK PIECES, GRAVEL- STYROFOAM.
2. THICK LAYER OF NEWSPAPER (WET FIRST) approx 1"
3. THIN LAYER OF VEGETABLE SCRAPS.
4. STRAW 12" DEEP
SUGGESTION
perhaps lay plastic down first as garden area will be constantly moist.

PROFILE OF BED: C—D:



Herbs:
Coriander
Chives
Brinjal
Capsicum
Chili
Spinach
Onions

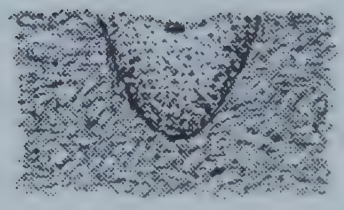
WHEN PLANTING



1) YOUNG PLANTS/SEEDLINGS:

Make pocket in straw & fill with soil 4-6" deep & approx. 3-4" wide to plant into.

LATER: when you have ready compost available, you can use that mixed with a little soil.



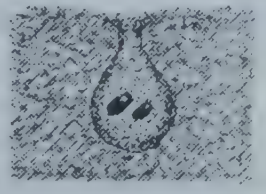
2) SMALL SEEDS:

e.g. carrot, radish, beets, spinach various coriander. Part straw (mulch) to form a long narrow row, approx. 2-3" wide & 3" deep - make a small 'gutter' with some soil along the centre, sow seeds in that and cover with fine layer of soil $\frac{1}{4}$ - $\frac{1}{2}$".

3) LARGE SEEDS:

e.g. Beans - Place a pocket of soil 4" deep and place seeds directly in at about $2\frac{1}{2}$ - 3" depth.

Cucumber/gourds - Same as for beans, but seed should be placed $\frac{1}{2}$ - 2" deep.



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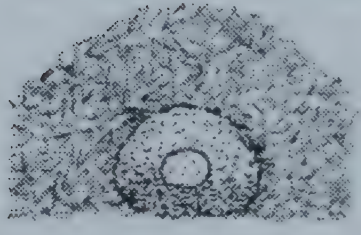


4) POTATO:

Plant at bottom of mulch with approx. 2" soil all around potato.

WHAT TO PLANT WHERE

Ask for indigenous (non hybrid) seeds of vegetables suitable for the existing season.

i) AT THE BACK: (near parapet) all creeper/climbing varieties e.g. all gourds, beans, cucumbers, tomato, peas, etc.

ii) IN CENTRE: Large plants like brinjal, capsicum, chilli, etc.

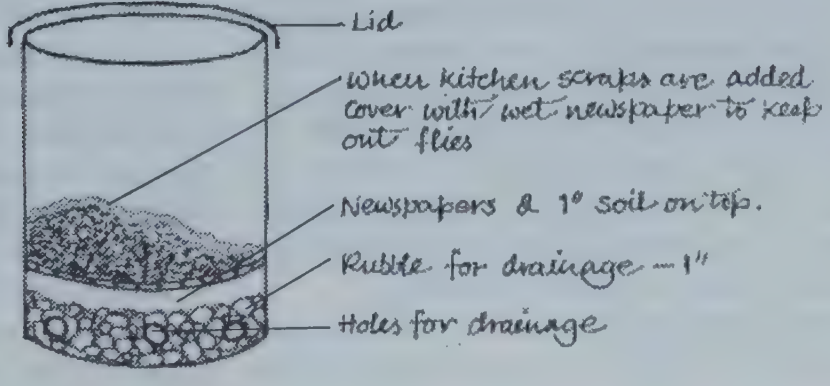
iii) NEAR FRONT BORDER: Smaller plants like coriander, amaranth, etc.

GOOD COMBINATIONS:

* Beans & cucumber
* Also near tomato: carrots & radish (sow seeds together)
* Tomato & marigolds

COMPOST BIN

N.B: Best to use raw vegetable peelings & fruit. Avoid left over cooked foods.


Lid
When kitchen scraps are added cover with wet newspaper to keep out flies
Newspapers & 1" soil on top.
Rubble for drainage - 1"
Holes for drainage

From Waste to Wealth

Productive Re-cycling of 'Waste'

The earth getting smaller? Maybe not. But it is definitely true that our resources are undergoing entropic degradation. This simply means that energy previously available (for any work) is becoming unavailable.

Our mineral resources and fossil fuel reserves are diminishing, while population and demand are expanding. When will the crunch come? How bad will it be? What will we do? These are questions which many governments, corporations and university researchers are grappling with, at least at an academic level.

While the need for alternatives will become more urgent, the switch over is not likely to get any easier. As we fiddle with figures and chop a few thousand trees (many more?) to churn out research-papers and books on the subject, the conventional energy pie continues to crumble - inexorably. There is no replenishment to talk of, and old illusions of cheap, safe nuclear energy now need a sensible burial. In many parts of Europe & America, previous orders for nuclear reactors have been cancelled, while existing Plants are being gradually decomissioned. Unfortunately, the 'Third World' continues to be a dumping ground where inconvenient questions are rarely asked.

What has actually been DONE in harvesting alternative sources? A great deal, but in isolated pockets and still too far behind the clock, considering all signs that a break-down may come sooner than most people expect.

At least the ground work already done has clearly demonstrated the feasibility of various alternatives on a small-scale for local communities and bio-regions. Though the work done is local and small-scale, the broad strategy underlying it has global relevance.

1. Sensible priorities for the conservative use of fossil fuels (and other resources)
2. Location-appropriate harvesting of renewable sources
3. Re-cycling of waste, wherever possible, guided both by ecological and economic considerations.

What is 'Waste'?

Waste is the by-product of an inefficient process that ignores the principle of optimum utilization.

Much of 'Waste' can be a valuable RESOURCE through intelligent re-cycling. But like all resources, if it is in unmanageable excess (i.e. in the wrong place at the wrong time), it is a POLLUTANT.

Green Guerillas, the Great Gleaners

It all began on one of those weekend outings to escape the oppression of the city. A motley group of a dozen people - which included a 3-year-old and her grandfather - were revisiting a favourite spot. As they turned the last bend to their destination, they were disgusted to find the place thoroughly littered with 'Pan Parag' packets, empty cigarette packs and an assortment of plastic, paper, foil, tin and glass. Apparently, the students' union of a city college had organised a picnic there the previous day.

After a back-breaking half an hour, and no small satisfaction, the group sat down to replenish their energy with an early lunch. Only 3-year-old Tina was disappointed that the new "fun game" of picking and throwing colourful odds and ends had stopped.

As they ate quietly, Rusi remarked what a great job street urchins were doing, clearing the city litter of paper, plastic and foil for re-cyling or re-use in some way. The "old man" had just returned from what he swore was his last trip to the U.S.A. One of his favourite hobbies was to launch a tirade against the "bloody American wasters". This time he spoke of the growing concern about the waste disposal problem they were facing despite their huge ground area. While

a number of re-cycling initiatives were under way, the labour cost involved in collecting and sorting the garbage was a deterrent, apart from the sheer volume involved.

Nandita remembered an article she had recently read. Apparently in Auckland, N.Z., the municipal authorities were actually paying households for the garbage they collected from door-to-door. All that the citizens were required to do was to keep the garbage in separate organic and inorganic heaps. The organic heap was for kitchen left-overs, all plant-matter and paper. The inorganic heap consisted of plastic, foil, cans, bottles, and an assortment of discarded paraphernalia.

The options for re-cycling organic waste included its direct(untreated) use as mulch for growing roadside trees and plants or for avenue cropping. Other possibilities were composting, producing methyl alcohol (mainly for use as a substitute for lead in petrol), and harvesting energy as bio-gas or electricity in a variety of ways.

A few months earlier, some of the younger members of this odd group of nature-lovers had gone around collecting kitchen waste from the households in their Anand Baug colony, confirming fears that they were a lunatic lot. Undeterred, they had proceeded to lay out a small, sheet-mulch vegetable garden in the front-yard of one of the houses. The garden grew very well, and seeing the crop of vegetables appearing, several neighbour and visitors wanted to start their own kitchen gardens.

Krishna had remained uncharacteristically silent all through the mountain-side discussion on garbage. He had recently joined the Street Child Foundation as a part- time worker, and he was enjoying his job. Quite abruptly, he blurted, "Can't the Street children also collect kitchen waste and earn some money by helping to start vegetable gardens in the city?"

Everyone agreed that it seemed a damn good idea, definitely worth a try. The following Monday, when Krishna discussed this with his colleagues at the Foundation, they were enthused. And so were the kids, when their first sheet mulch garden began to give yield.. This was laid in a corner of a school playground. Two to three months later, the creepers offered a variety of cucumbers, bottle-gourds and bitter-gourds. But some of the other vegetable plants had suffered from trampling.

Their second kitchen garden laid on the roof-top of an actress's home was doing even better. This time they had got excellent organic mulch from a'fruit-plate' vendor in a busy commercial area. It had a good-looking assortment of peelings from bananas, papayas, chickoos, pineapples, mangoes, water-melon..... All that healthy nourishment was showing in the luxuriant growth of the roof-top vegetable garden, perhaps the first of its kind in the city.

This time, it had all been so easy. The fruit peels layer was topped with ten inches of straw and 2 inches of rice-husk got from the city wholesale market.. The planting of seeds, seedlings and the first watering took barely half an hour. Lo and behold, they had a neat-looking vegetable garden in the making. Now, two months later, it was a great source of pride to everyone concerned.

As the kids enjoyed their celebration with tea, snacks and songs on the picturesque roof-top, they decided to form a co-operative. They named themselves 'Little Green Guerillas' and for seed capital, they emptied the pocket of all the kids concerned to collect a sum of Rs. 63.50. Out of this, Rs. 13.50 was again re-distributed in equal share, and a treasurer elected to take charge of the balance.

A lucky break came when a prestigious city club allowed them free use of a small, narrow strip at the furthermost edge of their ground. This became a demonstration site nursery and compost plot. Work came in steadily, and within 6 months, they had a tally of 23 sheet mulch garden laid by them. Around this time, the television carried an half-hour feature on the kids and their work, and overnight, the Green Guerillas were famous. Literally, hundreds of people suddenly wanted to start kitchen gardens in tiny plots around their buildings or on their roof-tops. The Little Green Guerillas had sparked a little revolution.

- Sunil Sinha.

(Writer's note : *The characters in this story are fictitious, but in all essential respects, the possibilities indicated are real.*)

Energy from City Waste

Kisan Mehta

Among various soft energy alternatives, city waste provides a constantly renewable and viable source.

In Bombay with an estimated population of eleven million people, about 4500 tons of solid waste and 1600 million litres of liquid waste are generated every day. The Municipal Corporation of Greater Bombay spends about Rs. 30 lakhs a day in collection, transport and disposal of city-garbage.

Solid waste is presently dumped in low- lying areas creating serious environmental problems. The World Health Organisation has observed that open dumping of garbage, as practised in Bombay at present, should be considered unacceptable as it results in polluting water sources and creating environmental pollution. City waste dumped near areas having high concentration of human habitation also endangers public health of residents. In this context, turning city-waste to more positive use becomes relevant.

There has been much research and experimentation in recycling city-waste to a purposeful use, particularly in the industrially advanced countries. The possibility of generating electricity is one amongst many alternatives for waste management. Electricity generation using methane gas to be harvested when the solid waste is in the process of degeneration, as well as using steam created through incineration of waste have become commercially viable and environmentally acceptable.

About 350 million out of India's projected population of 1000 million by the year 2001 will be residing in cities generating 140,000 tons of waste a day calculating at an existing average per capita rate of 400 grams. A ton of refuse can substitute about 0.7 tons of coal in power generation which would literally mean a saving of about 100,000 tons of coal a day in energy-generation if a conscious effort is made from now on to turn city waste into energy. For any smaller town, this can become the basic source of supply of electricity. Continuing the dumping of 140,000 tons of waste a day is equivalent to throwing away 5.1 million tons a year of precious raw material, which is bound to create insurmountable ecological problems for the country. Cities now have an urgent responsibility of re-cycling the wastes they create into productive use.

(extracts from a 4 page transcript of a talk on A.I.R. Bombay, 9.7.89. Shri Kisan Mehta is president of the 'Save Bombay Committee', 123, Mahatma Gandhi Road, Bombay-400 023.)

Poison PCs : The Growing Environmental Problem

Leslie Byster of the Silicon Valley Toxics Coalition talked about the downside of the high-tech revolution and its impact on people's health and the environment. In particular, she cited the rapid product obsolescence of personal computers (PCs) that leads to escalating piles of e-waste in the USA and other industrialised countries.

PCs contain over 1,000 materials, many of which are highly hazardous such as lead, cadmium, mercury, hexavalent chromium, PVC and brominated flame-retardants. If dumped in landfills, these toxic substances will seep out, contaminating soil and groundwater and posing a treat to people and other living organisms. If incinerated, it will increase the concentration of heavy metals in the slag, fly ash, flue gas and filter cake and generate toxic emissions such as dioxins.

Ms. Byster identified open air burning of plastics to recover copper and other metals, a common practice in Asian countries, as most dangerous. The toxic fall-out from open air burning affects both the local environment and the broader global air currents.

She also pointed out that recycling e-waste causes many health hazards to the workers, and that the export of e-scrap from developing countries is creating major environmental damage in the importing countries.

Ms. Byster introduced the 'Electronics : Take It Back (ETIB) Campaign' that supports the guiding principle called Extended Producer Responsibility (EPR) for post-consumer e-waste. The objective of EPR is to make brand name manufacturers financially responsible for their products when they become obsolete.

For more information,visit www.svtc.org or write to Leslie Byster (lbyster@igc.org)

US dumps e-wastes in India, Pak, China

WASHINGTON: Most old computer parts taken to California recycling centres are shipped to China, India or Pakistan, and buried in rice fields or dumped into irrigation canals, says a new report.

This was the finding of an international coalition of environmental organisations that said huge quantities of hazardous electronic wastes (e-wastes) were being exported to China, India and Pakistan where they are processed in operations that are extremely harmful to human health and the environment.

The organisations - Basel Action Network (BAN) and Silicon Valley Toxics Coalition (SVTC), with support from Toxics Link India, Greenpeace China and SCOPE (Pakistan) - have released a full report on the investigation entitled: "Exporting Harm: The High-Tech Trashing of Asia".

The report calls shipments of electronic scrap from industrialised nations to developing countries "a dirty little secret of the high-tech revolution", which has been "studiously avoided" by the electronics industry, government officials and many recyclers.

Environmentalists say various water samples have been taken to determine the amount of toxicity in the water, but the impact on humans is not yet known.

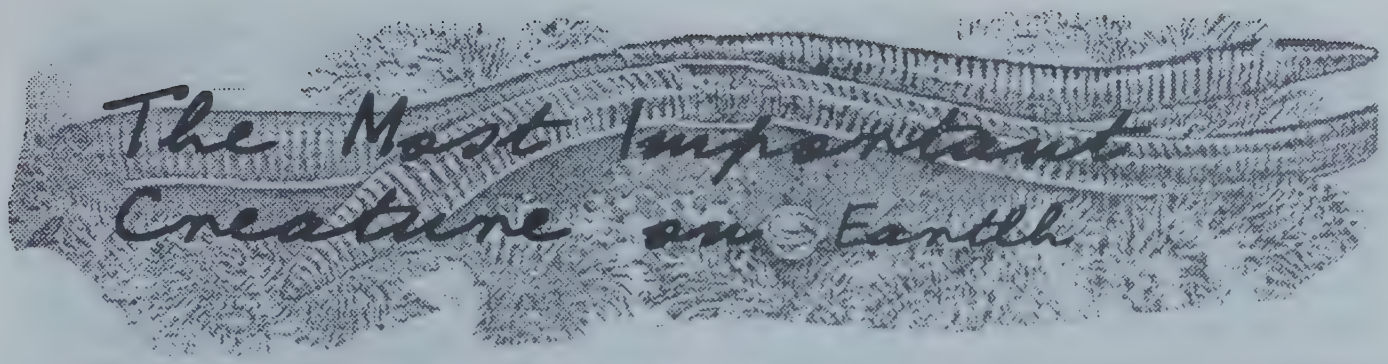
"There were examples of where people would put fish into some of these waters. In very short order, the fish would die," said Ted Smith of the Silicon Valley Toxics Coalition. "It's just levels of pollution that we're not used to seeing. I'm sure that the human health tragedy there is enormous."

Smith says it all comes down to money. It costs between $5 and $10 dollars per computer for proper recycling. There was legislation discussed in Sacramento last week addressing the issue, but so far no action has been taken.

The investigation uncovered an entire area known as Guiyu in China's Guangdong province, surrounding the Lianjiang river just a four-hour drive northeast of Hong Kong where about 100,000 poor migrant workers are employed breaking apart and processing obsolete computers imported primarily from North America. The workers were found to be using 19th century technologies to clean up the wastes from the 21st century. (IANS)

Times of India, 27th Feb 2002

A woman smashes a cathode ray tube from a computer monitor in Guiyu at China's southern Guangdong province.



Which animal tills, purifies and fertilizes the enormous masses of soil for us, and rejuvenates our agricultural lands after incessant use has sapped their productivity ? This animal has no limbs, no teeth, no backbone. It is but a tiny creature, often used as a synonym for spinelessness. This creature is the earthworm which works so silently and unobstrusively at our feet that we have taken very long to realise its real worth and bestow over it the attention it deserves.

While we are scaling the heavens with the miracles of modern technology - the satellites and the spacelabs, we have also been compelled to look right under our feet for, the super 'tractor' which is capable of conserving and activating our earth as naturally and as safely as no other device is able to do. Scientists the world over are now busy harnessing the natural abilities of the earthworm in reviving the agricultural fields and cleansing the ever-increasing loads of waste that is piled over the earth everyday.

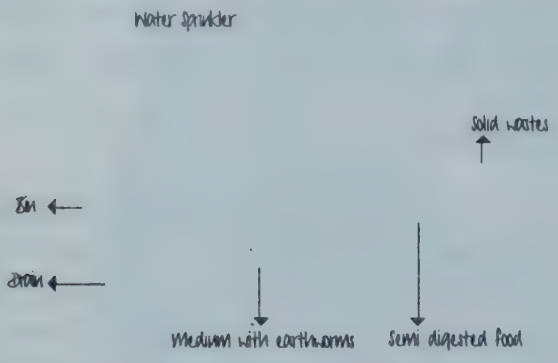
Earthworms devour soil. As the soil passes through the worm's guts, it gets naturally processed by the enzymes and micro-organisms present in the guts. The resulting castings, which may loosely be called 'digested soil', are richer in utilisable nutrients, enzymes and microflora. It has been shown that earthworm castings contain upto twice as much available nitrogen, seven times as much available phosphorus, and eleven times as much available potassium as the surrounding soil. Bacterial growth is also greatly stimulated which helps in the creation of soil-supporting humus. Most important in this process, the excessive acidity or alkalinity of the soil gets reduced and is brought close to the pH of fertile soil. The constant burrowing of earthworms opens up the fertile soil to let it 'breathe' air and absorb water much deeper than it otherwise would. In loose soils, the earthworms push their anterior portions in crevices and then bore in slowly, forcing away the obstacles. When confronted with compact and tough soil layers, the earthworms just eat their way through. The worms can burrow very deep into the soil, some species can go to depths which are much beyond the reach of plant roots. From such depths the worms bring up life-sustaining minerals for use of the plants. No wonder then, that introduction of a large number of earthworms into agricultural land has been shown to double the yield of wheat, quadruple the yield of grass and multiply the clover yields ten times.

Waste Cleaners

From the recognition of the earthworms' contribution as soil-conservers to their use in the treatment of organic waste is but a small step. However, mankind has taken thousands of years to take this step. Canada was the first country to install a waste consumption facility based on 'earthworm power' which is now processing over 80 tons of refuse per week. The refuse consists of all kinds of organic waste, including household garbage, city-refuse, sewage -sludge, waste from food and fibre industries and different forms of paper -waste ranging from old telephone directories to outdated office memos. With the success of this facility, several more similar waste treatment facilities are now planned to be installed throughout Canada. In Japan too, earthworm-based pollution abatement facilities are being set up. The difference between Canadian and Japanese facilities was that the latter treated specific types of industrial waste up to 10 tons per day. Earthworms do nearly all the work in these treatment facilities. They continuously turn and aerate the refuse, break it down, and process it into rich manure that can be safely and profitably recycled back into the earth.

The nitrogen present in the world's sewage and rubbish is of the order of 5 million tonnes which is nearly equal to the nitrogenous fertilisers that the world's chemical industries are capable of producing. Earthworms have the potential of converting this organic waste into fertilisers and thereby doubling the

world's fertiliser production. At a demonstration in southern California, USA, 10,000 kilograms of rubbish ranging from old magazines and diaries to straw and grass chippings was converted into fertilizers by an army of earthworms in a matter of 40 days. The entire process is virtually free of operation or maintenance costs because the worms do all the work and 'provide' all the energy needed. They also contribute to the disinfection of sludges by reducing the survival of pathogenic bacteria. It appears that the microflora within the earthworm gut are able to out-compete the pathogenic organisms. The success of the star demonstration process has spurred the Americans to go for 'vermicomposting' in a big way. Already many



earthworms ranches are in operation where selected species of earthworms, especially the 'redworms' (Eisenia foetida) and 'nightcrawlers' (Lumbricus terrestris) are raised and sold. Philippines has also taken to earthworm technology in a big way.

Earthworm Technology in India

In India domestic animals - buffaloes, cattle, hogs and chicken - produce over 400 million tonnes of manure, only a part of which is used for bio-gas, fuel and fertilser. The collection, treatment and disposal of household-garbage poses a major burden on our resources, and the failure to do so effectively in most of the cities and towns in India is the prime cause of filthy conditions and health hazards prevailing there. Any technology which requires little establishment costs and which converts waste material into manure usable near the site of its production, is highly appropriate especially to the Indian situation. Earthworm-based waste-treatment is such a technology.

S.A. Abbasi

(Mirror, March 1989. The author is on the faculty of the Salim Ali School of Ecology, Pondichery University).

The Fireless Cooker

(Deforestation, the Cooking Fuel Crisis & Alternatives)

In many parts of India, tribal women trek long distances and spend several hours each day gathering firewood for cooking. Foresters never seem to tire of bemoaning the damage they cause to forests. The government's policy now seeks to restrict entry of the local people in protected forest regions. Even some well-meaning environmentalists seem to support this policy. By similar reasoning, can polluting industries and automobiles be banned from the cities for poisoning the air we breathe? It is obvious that we urgently need alternatives which can meet basic human needs and yet preserve the health of the environment.

The alternatives for meeting the fuel crisis are not only relevant to tribal women using firewood for cooking. The issue goes much further. With the steady rise of carbon dioxide in the atmosphere from the burning of wood and fossil fuels, the reserves of which are steadily diminishing, all cultures must adopt technologies that will reduce this dependence.

The widespread use of two time-proven techniques for "fireless" cooking — the solar-oven and the haybox — can dramatically reduce domestic energy consumption for food preparation, be it firewood, kerosene, gas or electricity. A third alternative is a partial change of diet to eating raw foods (salads, sprouts, fruits and nuts), which a number of people are now adopting for its higher nutritional benefits.

The following article takes a look at hayboxes and haybags which are low-cost, easy-to-build, insulated containers in which the cooking of pre-heated food gets completed with considerable energy savings - 40% or more. A variety of locally available materials (not just hay) may be used to make these fire-less cookers.

This article has been pieced together from extracts taken from the International Permaculture Journal (Issue No.32,1989-II) and the newsletter published by the Centre of Science for Villages, Wardha (Issue No 2.....1988).

The World of Hayboxes :

Haybox isn't a new technology or a fad. These cookers have been used in Europe from medieval

times. In Vienna, Dr. Heidi Kirschner learned about the hay-box cooker during her childhood and has continued to use this energy-and-time-saving method for almost fifty years. In India, Marjorie Sykes (92 years and still energetic), the Britain-born Quaker who worked with Tagore and Gandhi, similarly taught many people the use of this simple technology for coping with fuel shortages.

In South Africa, an organisation called *Women for Peace* promotes haybox cookers for conserving scarce fuel. The group sells the "Wonderbox" together with a recipe booklet "Wonder Cooking and Simple Living." According to the organisers, they can barely keep up with the demand: about 1,000 Wonderboxes each week. Handicapped or unemployed women assemble these fire-less cookers. The Wonderbox addresses concerns common to all: energy, food and labour.

Rwanda (population six million) is the most densely populated country in Africa. About 95% of the population uses wood for fuel, either directly or as charcoal, and the staple food is the common bean. Recently, a small number of Hayboxes were introduced to one region of the country with success. The Ministry of Energy and some other projects have taken note of this experiment and possibly, in the near future, a larger number of people will be introduced to the Rwandan Haybasket. (In Rwanda, baskets are very common and therefore used rather than cardboard or wood boxes to make the haybox). The use of haybaskets reduced the consumption of wood by about 40% compared to traditional cooking methods. Similar results were obtained in Malefioane, Lesotho in 1982 (Cookstove News, No.3.1)

Everything you always wanted to know about Haybox Cooker

How do you construct a Haybox with a two-pot arrangement?

The simplest way consists of using a large container which accommodates both pots plus approximately 4 inches (10 cms) in between and in all other dimensions. Any available insulating material may be used, first to cover the bottom, then when the pots are placed on this layer of insulation, stuff all around them tightly, then make a pillow stuffed with the same insulating material, large enough to cover both pots tightly and to fit the container well so that no empty air pockets remain which would cause heat loss. The various materials that have been used are listed below, but there must be scores of others, and particularly for use in the third-world countries, it will be important to find out just what is available, suitable and inexpensive.

a) Hay or straw works well. Probably the oldest stuffings for the fireless cooker, they are nice for traditionalists! (The hay/straw should be chopped so that the stuffing in the box is compact).
b) Lawn clippings will work — if thoroughly dried.
c) Shredded newspaper is excellent.
d) Pillows made of feathers, raw cotton, old rags or any other insulating -material could be used.
e) Saw dust or wood shavings can be used, but only in pillowcases; otherwise, they are messy.
f) Polystyrene pellets have superior insulating qualities. They adapt particularly well to the size and shape of different pots, and they can be readily washed in case of a spill. Pillows stuffed with polystyrene pellets drape so well that only top and bottom pillows are needed — your cooker won't need a middle one.
g) Polyester fiberfill also gets high recommendation for high insulation, long life and washability.
h) Foam rubber pillows are stiff. They can be used particularly to cover the bottom or the top of a cooker but in that case, a long soft pillow is needed to wrap around pots (of various sizes).

How do you get people to use the Haybox cooker?

That's a very good question and difficult to answer. Most people the world over are strongly attached, emotionally, to the foods they have become accustomed to and to the way they have been prepared. They are reluctant to make any changes and will try their best to invent reasons why they could not possibly even consider a change. I have been able to convince people that it would be worth their while to try this so very "difficult" method of cooking only after they saw me prepare a meal and found to their surprise that it tasted "exactly like mother used to cook it" or even better. Only after this has been established, are people willing to listen to other reasons why the method may be important to them.

In developing countries, the most logical reason is, of course, that so often critical fuel shortages exist, and, that conventional fuel sources are a disastrous disturbance to the ecology! Alas, people's eating and cooking habits have nothing to do with logic and it

takes a lot of hard work to convince anyone. But it can be done!

In my own experience, I have found that someone who has just seen me bring a pot of rice to a boil and simmer it for five minutes (timed!) and put it in a fireless (Haybox) cooker will invariably say that this was too short a time and that the rice will not be done.

I have developed a habit of smiling at that point to say: "Well, let's see!", and then continue with whatever lecture I had planned. I would talk about advantages like the simplicity of the method, the savings of time, the freedom gained to go away and do other things while dinner cooks (by itself), the convenience when entertaining and many others. Perhaps I would spend some time on the construction of fireless cookers, convenient places in the kitchen to put them and finally allow plenty of time for people to ask questions.

At the end of about an hour, I would ask one of the audience to open the cooker and show the steaming hot, fluffy, perfectly finished rice, then I would offer samples on small plates, topping each with a helping of stew with lots of gravy, and sometimes, vegetables which I had prepared at home and brought in another Haybox cooker. At that point, many listeners were "sold" on the idea, bought books (at cost) and expressed eagerness to make their own cookers or borrow one of mine to try out.

What ? You carry your own haybox cookers? Are they portable?

Yes. Portable haybox cookers are good not only for demonstration purposes, but also have many other good uses: I like to bring mine to the dining table and set it on a side table or stool of convenient height so that I can serve directly from the pot while it remains in the cooker, and then replace the lid and top pillow promptly to keep food hot for second helpings for late comers. Portable cookers are also useful for going to parties, picnics, etc., or if you have a small kitchen (where a cooker is difficult to store).

Portable Haybox Cookers can be built very easily. Any carton or basket can be used for a portable cooker, or if you like something fancy, a pouch-style home-made portable cooker-design is described in my Fireless cookery. To avoid spilling in transit, I recomend to use a pressure cooker (without pressure) because of its spillproof lid.

What quantities of food can I cook in a haybox?

Not too little. Little dabs of food in small saucepans don't cook enough because the heat and steam dissipate too quickly.

Not too much. Generally, anything larger than a 6 quart kettle in a fireless cooker is unmanageable, unless your cooker is an improvised kind. Use two pots instead! This will reduce the boiling time considerably! Always keep in mind the rule of thumb : the food in these fireless cookers should fill about two — thirds or 65% of the pot or be about 2 inches (5 cms) from the top.

Other Advantages of Haybox Cookers:

Keeping food warm until serving time. Some foods do best with short cooking times and others take much longer. If you are planning a meal at a given time, you have to have all the things ready then. How do you solve the problem of keeping things warm ? Haybox cookers can keep them warm until you are ready to serve them !

Solving the problem of different eating schedules.

Dinner can be served for one group of people, (returned to the heating unit, brought to the boiling point briefly, if necessary), and placed back in the haybox cooker. It will be hot, delicious, and not over-cooked 2 or 3 hours later when the next group of people arrives for their meal. Some foods don't lend themselves to re-boiling or re- heating — for instance, rice or noodles — but the fireless cooker can help keep this type of food attractive and tasty.

Supplementing a one-heating-unit kitchen.

In many third world countries and poor households, only one heating/cooking unit is all the family has for preparing the meals. A Haybox cooker can then serve as a place where one or two dishes are being cooked or kept warm while other dishes (e.g. chappati or tortillas, etc.) are being prepared on hot fire (heating unit).

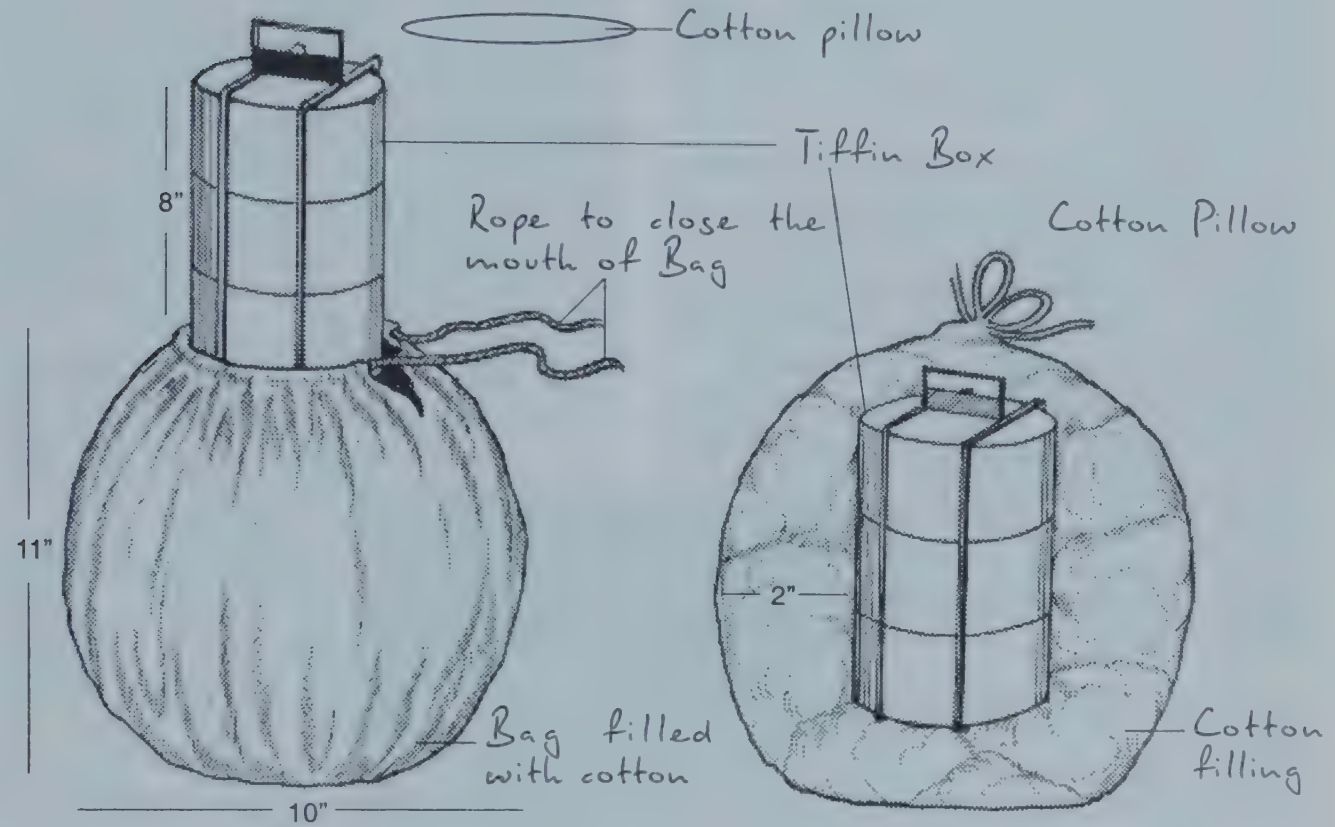
Use as cooler box.

Because a fireless cooker is simply a device to keep food well insulated, it will serve equally well to keep the beverages cold, if it is cold when placed in the cooker.

About the author:

(Dr. Heidi Kirshner grew up in Europe and has worked extensively to promote this energy-saving method of cooking tasty, nutritious meals. She is the author of ***'Fireless Cookery: A Traditional Energy-Efficient Method of Slow Cooking',***

HAYBAG COOKER



Haybag Cooker

Haybag Cooker is a cooking device that saves fuel. The bag cooker is filled on all sides with 3 to 5 inches thick insulating material. The insulating material can be rawcotton/feather/rag/oldwoolen/fibreglass/shredded newspaper etc. The bag can be stitched in materials like cotton, plastic, leather etc.

Working

Cook the food stuff on the fire till it reaches boling point; let it boil for a few more minutes (five minutes are enough). Remove the cooking pot from the fire and place it in the hay bag. The insulated walls of the hay bag do not allow the heat of the pot and cooked material to escape; thus retained heat inside helps to cook the food without additional fuel. The fuel saving by the use of hay-bag ranges from 25% in case of charcoal, to 50%, if biogas is used. It takes 30 minutes to cook the food in the hay box. For better result, do not open the bag for one hour. The food inside will slowly simmer and will taste good. For pulses or other hard cooking materials, reduce them into small sizes, e.g. pigeon pea should be ground to one eighth of its original size and soaked for four hours before cooking. Broken pulse grains are available at a cheap rate in the market. The bag can be carried on the bicycle to the working place. Inside the hay bag cooker, the food not only cooks well but also remains hot for three to four hours. Cost: Rs. 20/- only. (it can be fabricated at home without cash input by using old pieces of cloth)

Contact Renewable Energy and Environment Division, Centre of Science for Villages,Warda — 442001, Maharashtra

Wonders of the Sun

Installation of solar panels have made life comfortable

LIAN CHAWII

Mundanmudy

The solar lighting system in Mundanmudy village, the largest installation of its kind in the world, has changed the life-style of local people here. The hundreds of houses (393 precisely) lined one after the other with bright solar panels in this village of Idukki district in Kerala, are quite impressive.

Mundanmudy village is located at an elevation of around 1,500 - 2,000 metres near a reserved forest, with no access to the electrical grid. The connection only reaches the foothills, and even here due to the transmission losses, the light in the last few houses only glimmer.

Till 1997, the entire village was dependent on kerosene lamps. But, with the introduction of solar lighting system, the lighting dreams of this village have come true. Rajagiri College of Social Science (RCSS) adopted this village in collaboration with the Community Aided Sponsorship Programme (CASP), an NGO based in Mumbai.

Light to all : solar panels being installed

The Adoration Sisters (nuns), based in the village conducted a door-to-door survey, which revealed that electricity and drinking water were the major problems of the villagers. This survey report was submitted to Japan's Ministry of External Affairs who subsequently released a grant of Rs.33 lakh under its grant-in-aid for Grassroots programmes, under which the college had earlier received grants.

Under the project, the households (around 590) were divided into 15 units, each unit consisting of 30 to 40 families. These households nominate their leaders who form the central committee where the convenor is usually a male and the joint convenor, a female. "This is because we encourage women's participation in our projects", says Benny George, manager, Aditya solar shop in Cochin. George was the coordinator of the RCSS team when the project was undertaken.

Calculations revealed that Rs.33 lakh was not sufficient to execute the project on both electrification and drinking water supply. Though a set of solar panels cost Rs.11,200 only, Rs.8,500 was left for each household, so families interested in installing solar panels contributed an additional Rs.2,700 each. Eventually 393 households, around two-third of the entire village, agreed to take the chance. The solar sets are made by TATA BP Solar, a joint venture of BP solar and TATA.

Solar Tech, a Cochin-based company carried out the tough task of installation in this village with no decent infrastructure. Aji Augustin, an engineer from the company, faced the challenge of installing them in houses scattered across the village and interspersed between boulders and thick vegetation. "There were no proper roads that connect one house to the other, so installing the solar panels was difficult", says Augustin. Three local people were trained to assist him in installing the panels. The project eventually got completed in a short span of five months.

"The project was executed smoothly, because the government was not involved", says one of the staff of Solar Tech lightly.

The concept of solar lighting was not new to many of the people. This was due to the strategy employed by Solar Tech who installed

a panel at the Adoration Sisters' convent in the locality. "Curious villagers used to come and see the light and ask a lot of questions", says Augustin.

Life with the Sun

One of the first customers who came looking for a solar panel was Amina Sidiq, a 60-year-old lady, who is looked upon as a mother figure (*Amma*) by the local people. She knew that it would help her in operating her small teashop. Since Rs.2,700 was a huge sum for down payment, she borrowed the amount from a local money lender at a monthly interest rate of five per cent. She managed to return the money the same year. She says that it was worth the cost and she even wants to buy more. "Now I open the shop even after sunset", she says proudly. She also mentioned that her grandchildren who are as old as the lamps are so used to the solar lights that they would find it difficult in their absence.

One has to see to believe the changes brought about by the solar lights in the life of the local people. Anthony Verkey, convener of the project committee says: "Using a kerosene lamp, it is very difficult for the children to concentrate for a long time", and adds, "but now they can study for longer hours". Educational improvement is one of the most impressive changes brought about by solar electrification.

For Jobi Joseph, a student and a budding artist, there is sufficient time for both his hobby and his studies: "Now I can differentiate various shades of colours at night, while I study for my final pre-university exams during the day".

"Around 150 households have television sets now, and they are more aware of what is happening outside", says George. Thomas Kurien, one of the local people who bought a 14-inch black and white TV four years back mentions that he is able to watch cricket, his favourite sport, with the help of the solar lights.

The subsidised set now costs Rs.8,000 (which is otherwise Rs.14,000), but it is still unaffordable for these people whose annual income ranges from Rs.10,000 to 15,000. Most of them are dependent on rubber, which does not fetch them much income.

The rest

"The balance from the grant — around Rs. 2 lakh was used to built five ponds and five water tanks", says George. In addition, Rs.5,000 was collected from each of the 15 units to add to the project. Without any wages the local people volunteered to dig the ponds from where water flowed into the tanks built at a lower level. "In this manner water naturally collects in the ponds and flows downward without the need for electric pumps," says George. Sufficient water gets collected in the tanks to last the whole year, so the people need not extract groundwater. Before the amount is released, an engineer inspects the scene and submits a separate report for each stage, which involved digging of the ponds, protection and construction of water tanks. "The amount to be released depended on the engineer and how we interacted with him", says George. The report had to pass through at least five officials before it was finally cleared. Eventually, Rs. 1,20,000 was sanctioned to the community.

Prompt service : after sales service centre

Source : *Down to Earth*, July 15th, 2001

Creating Alternative Futures

(On economics & technology, ethics & ecology And the coming cultural transformation. Extracts from incisive writings by Hazel Handerson that "de-frock the economic priesthod" and suggest the shape of the morrow)

Economics is not a science; it is merely politics in disguise. And academic economics is a form of brain damage.

Economics has enthroned some of our most unattractive pre-dispositions: material acquisitiveness, competition, gluttony, pride, selfishness, short-sightedness and plain greed.

A fundamental problem that has resulted from the imbalance in our values is our obsession with unlimited growth. Continuing economic growth is accepted as a dogma by virtually all economists and politicians, who assume that it is the only way to ensure that material wealth will trickle down to the poor. This "trickle-down" model of growth is totally unrealistic. High rates of growth not only do little to ease urgent social and human problems, but in many countries, have been accompanied by increasing unemployment, a general deterioration of social conditions and serious ecological crises.

The global obsession with growth has resulted in a remarkable similarity between capitalist and communist economics. Already, the fruitless dialectic between capitalism and communism is being exposed as irrelevant, since both systems are based on materialism. Both are dedicated to industrial growth and to technologies that increase centralism and bureaucratic control. And both have neglected the wider, longer term consequences of such a development path.

What is wrong with current notions of economic and technological growth is the lack of any qualification. It is commonly believed that all growth is good without recognizing that in a finite environment, there has to be a dynamic balance between growth and decline. While some things have to grow, others have to diminish, so that their constituent elements can be released and recycled.

Systemic wisdom tells you that if you have something good, more of it will not necessarily be better. Today, we are totally pre-occupied with large-scale operations. But there is an optimal size for every structure and maximising any single variable will inevitably destroy the larger system.

In their attempts to maximize their profits, individuals, companies, and institutions try to externalize all social and environmental costs. This means that they exclude these costs from their own balance sheets and push them onto each other, passing them around the system, to the environment, and to future generations.

Today, it is no longer permissible to throw away our worn-out goods or dump industrial waste somewhere else, because in our globally interconnected biosphere there is no such place as "somewhere else". For the same reason, there is no such thing as a windfall profit unless it's taken out of somebody else's pocket, or gained at the expense of the environment or of future generations.

The consciousness that dominates the culture of modem civilization has found its expression in a certain 'macho' technology - a technology bent on manipulation and control rather than cooperation; self-assertive rather than integrative; suitable for central management, rather than regional self- sufficiency and local self-help through empowerment of individuals and small groups. As a result, most technologies today have become profoundly anti-ecological, unhealthy and inhuman.

Wasteful energy-consumption is countered by nuclear power, lack of political insight is compensated for by building more missiles and bombs, and the poisoning of the natural environment is remedied by developing special technologies, that, in turn, affect the environment in still unknown ways. By looking for technological solutions to all problems, we usually just shift these around in the global ecosystem, and very often the side-effects of the "solution" are more harmful than the original problem.

The complexity of our industrial & technological systems has now reached a point where many of those systems can no longer be either modeled or managed. Breakdowns & accidents occur with increasing frequency, unanticipated social and environmental costs are continually generated, and more time is spent on maintaining and regulating the system than on providing useful goods and services. Such enterprises, therefore are highly inflationary, in addition to their severe effects on our physical & mental health. Thus it is becoming increasingly apparent that

we may reach the social, psychological & conceptual limits to growth even before the physical limits are reached.

Today, we need wider application of appropriate technologies that incorporate ecological principles and correspond to a new set of values. Many of these alternative technologies – smallscale and decentralized, responsive to local conditions and designed to increase self-sufficiency already exist, or, are being developed. They are often called 'soft' technologies because their impact on the environment is greatly reduced by the use of renewable resources and constant re-cycling of materials.

Our current problems—whether we designate them as social, economic or environmental crises—are all part of the larger crisis of our myopic perceptions. These myopic perceptions, which were adequate for a quieter, slower moving age, no longer provide us with enough lead time to correct our course.

As we humans seem to be heading for an evolutionary cul-de-sac, the most creative and intuitive will still be trying to tell us that the way out of the box is to redefine the problem: to look up from our preoccupation with retooling the world and try changing our goals and focusing on our evolutionary task of developing ourselves. Future research is social learning. We are all in it together.

The aware and sensitive among us are already swept by such personal doubts, or identity loss, feelings of meaninglessness in their careers and even a sense of moral schizophrenia as they become aware of the social costs their institutional activities engender. However, I sometimes get impatient with people who only talk about social change. I keep telling them that we must walk our talk. I think it's very important for all of us to walk our talk. Politics, for me, has always meant organizing around social and environmental issues. But merely criticising is also not enough. We must actively explore, adopt and popularise saner alternatives.

Tle concept of wealth must shed some of its present connotations of capital and material accumulation and give way to a redefinition as human enrichment. Profit must be redefined to mean only the creation of real wealth, rather than private or public gain won at the expense of social or environment exploitation.

In an ecological paradigm, the main emphasis is on life, on the living world of which we are part and on which our lives depend. It is crucial to understand how a particular system is embedded in larger systems. Thus, an ecological approach to health will not only treat the human organism - mind and body - as a whole system, but will also be concerned with the social and environmental dimensions of health. Similarly, an ecological approach to economics will have to understand how economic activities are embedded in the cyclical processes of nature and in the value system of a particular culture.

As far as the status of different kinds of work is concerned, there is an interesting hierarchy in our culture. Work with the lowest status tends to be that work which is most entropic, i.e., where the tangible evidence of the effort is most easily destroyed. This is work that has to be done over & over again without leaving a lasting impact - cooking meals which are immediately eaten, sweeping factory floors which will soon be dirty again, washing clothes, etc. In our society, as in all industrial cultures, jobs that involve highly entropic work — housework, services, agriculture — are given the lowest value & receive the lowest pay, although they are essential to our daily existence. These jobs are generally delegated to minority groups and to women.

This hierarchy of work is exactly opposite in spiritual traditions. There high-entropy work is highly valued & plays a significant role in the daily ritual of spiritual practice. Buddhist monks consider cooking, gardening, or house cleaning as part of their meditative activities, and Christian monks & nuns have a long tradition of agriculture, nursing & other services. It seems that the high spiritual value accorded to entropic work in those traditions comes from a profound ecological awareness. Doing work that has to be done over & over again helps us recognize the natural cycles of growth & decay, of birth & death, and thus become aware of the dynamic order of the universe. "Ordinary" work, as the root meaning of the term indicates, is work that is in harmony with the order we perceive in the natural environment.

A central aspect of the current cultural transformation is the shift from the Petroleum Age and the Industrial era to a new Solar Age. The culture of the Solar Age includes the ecology movement, the women's movement, and the peace movement; the many citizen movements formed around social and environmental issues; the emerging counter-economies based on decentralized, cooperative, and ecologically harmonious lifestyles; and all those for whom the old corporate economy is not working.

In fact, the ultimate organizational design is already visible to those whose perception is attuned. These new organizations already exist, although they are metaphysical. They are most often referred to as networks, and their participants describe themselves as "networkers." They have no headquarters, no leaders, and no chains of command. They are free-form and self-organizing, composed of hundreds of autonomous, self- actualizing individuals who share a similar world view and similar values.

–Hazel Henderson

(Hazel Henderson is the author of "The Politics of the Solar Age" and "Creating Alternative Futures". E.F. Schumacher writes "I find Ms Henderson's essays illuminating the land- scape of our society like 'a flash of lightning, causing me intense delight. Every one of them have more "reality" than almost any other writings on societal problems I know."

Hazel Henderson has never attended college. She describes herself as "not only relatively unschooled, but also unchurched ... and uninstitutionalised". Maybe this accounts for the amazing freedom of her thinking. She describes the mainstream preoccupation with economics as our "reigning sophistry", and does not hesitate to say that, in all too many a cases, "the emperor has no clothes".

The above article has been pieced together from her various writings and also from her discussions with Fritjof Capra, quoted in 'The Turning Point' and 'Uncommon Wisdom'.)

·Do not adjust your vision.
Reality is at fault.

– Graffiti

·Destructiveness is the outcome of unlived lives.

– Erich Fromm

Struck down by apathy

A recent study shows that cancer is linked with environment. ANIL AGARWAL hopes that this new finding will make the Government sit up and draft a much-needed public-health policy.

'IT IS the environment, stupid, not the genes'. This is the stunning message delivered in a powerful paper published recently in the prestigious *New England Journal of Medicine* by scientists of the Karolinska Institute in Sweden. The study is bound to shake up the cancer establishment in India and abroad.

The study is huge - it covers nearly 90,000 twins – but very simple in its approach which makes it so powerful. Identical twins carry the same genes. So, if genes predominate as a cause of cancer then each twin should get cancer and the same type of cancer. Non-identical twins share only half the genetic structure. The study found that if one identical twin had cancer, the other twin had less than 10 per cent chance of contracting the same disease. Only a few cancers like breast and prostate appeared to have a stronger genetic link. The results are clear: genetic factors are far less important than environmental factors (chemical pollution, radiation, smoking, diet, infection, etc.) in causing cancer.

In the case of several cancers — Non-Hodgkin's lymphoma, Hodgkin's disease, cancer of the lip, oral cavity, pharynx, kidney, thyroid, bone and soft tissue - no genetic risk was found, only environmental risk. The incidence of Non-Hodgkin's lymphoma, a form of blood cancer, is on the increase in the

incidence of all cancers. The 1988 to 1991 data available for Delhi shows that this polluted city has a very high incidence of this cancer compared to other cities, especially among men.

Many scientists believe it has to do with some environmental change that is taking place worldwide, such as the growing use and human exposure to chemicals. Living in Indian villages makes a difference — the chance of getting cancer in your lifetime can climb down from one out of every nine to 15 persons in Indian metros to one out of every 18 to 34 persons. Delhi is extremely high in the incidence of lymphatic and haematopoietic tissue (that is, blood) cancers — which include lymphomas and leukaemias — almost twice that of other metros. But nobody in India's medical establishment has cared to find out why.

The Swedish findings are at one level very empowering, but at another level frightening

Empowering because we can do a lot to control our environment - pollution, diet, lifestyle, stress, etc — but we can do little to control our genes. Therefore, it is possible for everyone to prevent cancer just as in the United States where lung cancer rates have dropped substantially after the no-smoking campaigns began.

But given the speed and scale with which pollution is growing in poorly governed countries like India, given the highly toxic Western economic model we are adopting with such bravado, we will see an enormous rise in cancer cases. How will we deal with such a high-cost disease unless we have the foresight and courage to take strong preventive action?

As long as cancer was in the genes, we could expect the private sector to put in a lot of research investment as genes can be patented and economically exploited. But if cancer is in pollutants, most of the research investment will have to come from State coffers and the industrial community will oppose every finding. Despite overwhelming evidence, the tobacco industry fought back tooth and nail on the issue. The diesel lobby is today doing the same. So moving from genes to environment also means moving from public-private cooperation to public-private conflict. Will our politicians be able to deal with this challenge or just leave a lot of people, especially the poor, to die?

The study should also have serious lessons for the Indian cancer establishment, which till now has been extremely conservative to the point of fooling the public. Is cancer increasing in the country especially with the growing pollution? Cancer experts have two pat replies: "No, we cannot say anything with certainty. First, because our database on cancer incidence is very poor" (as if it is the public's responsibility to create one!); and "Because we did not have much knowledge of cancer diagnosis in the past, we have no data on past trends and therefore nothing to compare our results with."

All these are indeed true but they are also half-truths meant to support the callousness and inaction of the Government babus who are too powerful to be challenged. As of today, the Indian Government does not even have a serious programme to deal with cancer. Even the data on cancer incidence is not readily available to cancer specialists. The Ministry of Health is behaving like an ostrich, leaving the poor who can hardly afford the cost of treatment to die.

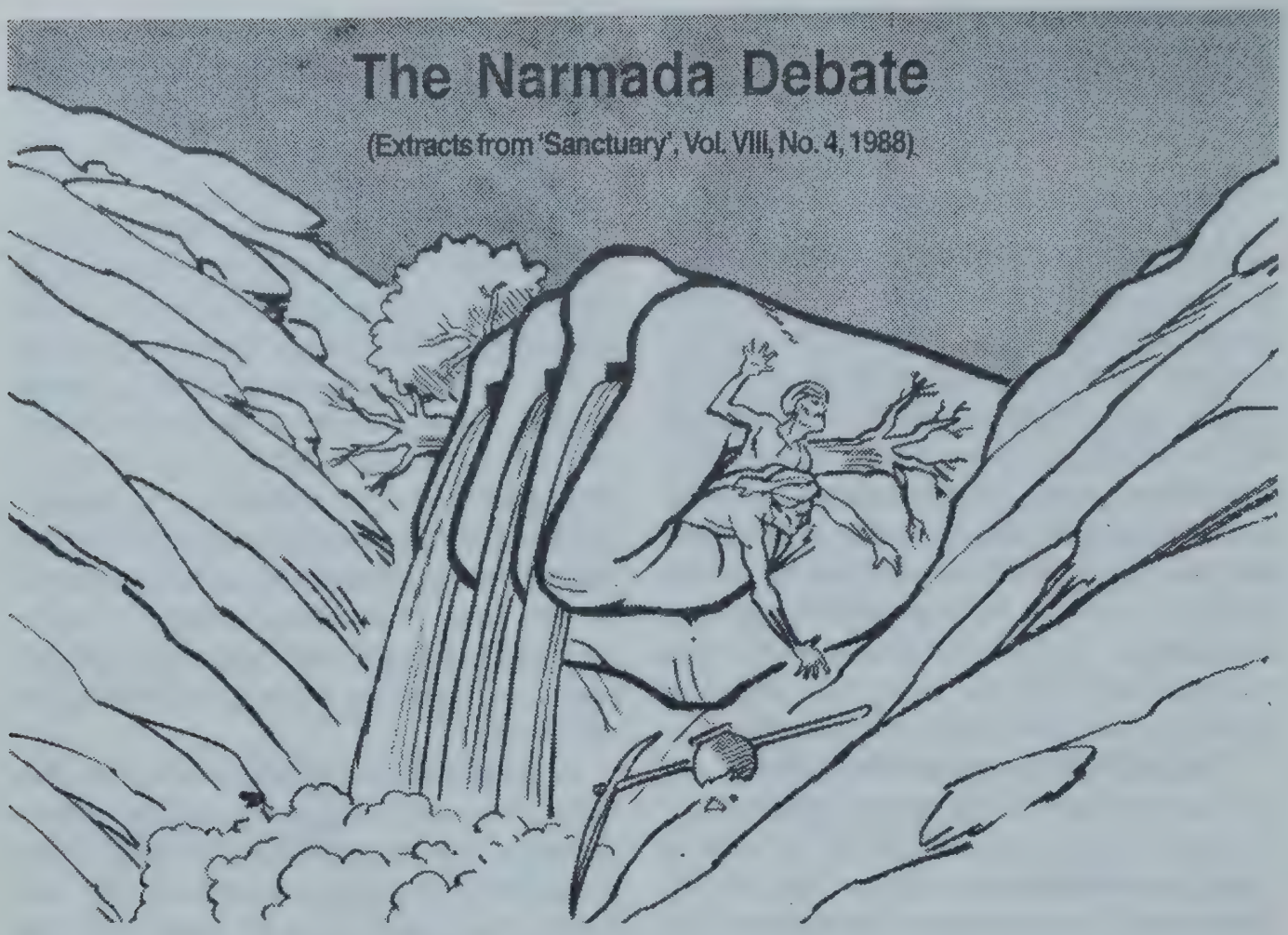
Hopefully, however, now that there is strong evidence that cancer is in the environment, civil society and irate citizens will force the politicians and bureaucrats to wake up, especially as it is often their policies and actions that are behind the dreaded disease. The Ministry of Environment mandarins believe this is the responsibility of the Ministry of Health to do something. The Health Ministry mandarins are, of course, so overworked dealing with diseases like malaria and diarrhoea that they don't want to hear about cancer.

As a result, nobody wants to deal with the threats to public health resulting from environmental change.

Hindustan Times
11th Sep, 2000

The Narmada Debate

(Extracts from 'Sanctuary', Vol. VIII, No. 4, 1988)



A large number of eminent people from all over the country have come together to send the Prime Minister, Rajiv Gandhi, a memorandum calling for a re-appraisal of the Narmada Valley Project (NVP). They have particularly questioned the benefits of the 2 giant dams proposed at Narmada Sagar and Sardar Sarovar and have highlighted the enormous environmental, social and financial costs these would entail.

The following is an abbreviated version of the text of the Memorandum :

"The NVP is the largest, single river valley project ever to be planned in India. Apart from the Narmada Sagar Project (NSP) and the Sardar Sarovar Project (SSP), it envisages the construction of 28 other major dams, 135 medium and 3,000 minor dams. The current official projected outlay for the NSP and SSP alone is about Rs. 15,000 crores. Bearing in mind the extraordinarily poor record of completion of large dams in India (more than 85% of those initiated since 1951 were yet to be completed by 1983) and, the enormous escalation in costs resulting therefrom (32 major projects showed cost overruns of 500% or more), the total financial cost of the NVP by the time work on all the dams is completed, is likely to be truly staggering.

Apart from these purely monetary costs, the country would have to pay an enormous social, cultural and environmental price for undertaking the project. This has, however, been only fragmentarily understood or taken into account by the project-planners. As illustrations, consider the following.

Several lakhs of people will be displaced from their homes. And the Department of Environment and Forests, Government of India (DEF) itself admits that for the NSP the "total land requirement of 40,000 ha. for rehabilitation has not yet been identified, let alone surveyed, for its capability, etc.; the lands identified are reported to be severely eroded and gullied; infertile with low water-holding capacity; suffering from general scarcity of water."

The same report states that the 'forest area specially affected by NSP represents areas harbouring a rich heritage of genetic resources as well as wildlife and goes on to list a variety of studies necessary before the exact dimensions

of the loss of biological diversity and genetic reserves due to the project could be estimated. In any case, the ecological significance of forests also includes their role in soil conservation, groundwater recharge and micro-climatic stabilisation. "The environmental cost is thus colossal" concludes the DEF and estimates it to be Rs. 30,923 crores for the NSP and Rs. 8,190 crores for SSP.

The Government's proposal to make up for this loss through compensatory afforestation must be regarded as a doubtful starter. Already the Government has admitted that equivalent non-forest land anyway meant for afforestation can hardly be regarded as a compensation. In any case, the forests to be submerged represent a uniquely inter-connected universe of countless species which have evolved through millions of years of adaptation. The possibility of regenerating such a system can only be regarded as a pipe-dream.

According to the Madhya Pradesh Council of Science and Technology, the NSP will lead to a rise in the incidence of malaria, filaria, cholera, gastroenteritis, viral encephalitis, goitre and some other water-borne and water-based diseases. The immense social cost of such human debilitation finds no place in the project evaluation.

The issue of possible reservoir induced seismicity (RIS) following the project still remains unclear. According to the National Geophysical Research Institute, Hyderabad, the Narmada dams may trigger off seismic activity. A much more detailed examination of the whole issue is obviously required, taking into account the combined potential impact of such a large number of reservoirs in the same river valley—which has not even been considered so far. The Government's latest note on the subject admits "for RIS, we do not yet have sufficient understanding of the mechanism by which seismicity is induced at any particular site... Identification of RIS-prone sites is not possible with the present state of knowledge." In a situation where the possibility of a national catastrophe resulting from the NVP cannot, therefore, be unequivocally ruled out, to go ahead with the project without the most careful investigation of this issue can only be regarded as a terrible mistake."

What is even more disconcerting is that there are equally serious doubts about the two principal benefits supposed to arise from the project —power generation and irrigation. A major justification for taking up the NSP and SSP, highly publicised by the Government, is that these projects would mean the generation of 2,450 MW of power. This figure, however, refers to the total installed power generation capacity of the two projects. The actual power generation through the projects is likely to be much lower. This is implicitly admitted even by the DEF which places the total firm power generation by the two projects at 523.5 MW.

Farmers and agricultural scientists have now for over a hundred years, questioned the wisdom of introducing large-scale canal irrigation in black soil areas of the country such as the Narmada basin because of the possibility of their becoming water-logged and saline. Already these fears have proved prophetic for the first major project of the NVP— the Tawa Dam of Hoshangabad district. And a study for the NSP conducted by the Indian Institute of Science, Bangalore (and sponsored by the Narmada Planning Agency) shows that nearly 40% of its command area faces potential water-logging. In any case, the irony of the fact "that NSP will submerge 91,348 ha. of land and provide direct irrigation to only 1,23,000 ha." is certainly not lost on the DEF.

Finally, and most importantly, we must note that the value of run-off availability from the Narmada River on which the NVP is based has officially been shown to be an overestimate by as much as 4.2 million acre feet (maf). No subsequent attempt has been made to re-evaluate either the benefits or the costs of the project, both of which will be critically affected by this over-estimation.

In the face of all these doubts and unanswered questions, it is truly surprising that the DEF has actually gone ahead and granted "environmental clearance' for the NSP and the SSP while at the same time laying down a condition that studies on each of these aspects be completed. This action of the Government raises the grave doubt that these studies are being viewed merely as academic exercises—a formality to be gone through with absolutely no bearing on the government's basic decision to proceed further with the project. Has it even been considered what would happen

if the combined effect of the findings of these studies were to necessitate a complete rethinking on the project?

The question arises with redoubled sharpness when we recognise that very meaningful avenues do exist for the alternate application of these scarce national resources. Over the past few years a very widespread realisation has grown that the present crisis facing the country is the culmination of a prolonged process of environmental neglect and degradation which, therefore, needs for its reversal a long-term strategy aimed at the restoration of the ecological balance. The various components of this approach, which lays primary emphasis on the development of dryland watersheds, through a variety of soil and water conservation measures include:

- Afforestation (with appropriate region-specific species) and Agro-Forestry (the system of growing together arable crops and trees which are compatible and complementary to each other).
- Improved dry farming technology (drought-resistant varieties of seeds, mulches, strip-cropping, minimum till age, suitable forms of inter-cropping and crop-rotation, etc.).
- Erosion control measures both mechanical (contour bunds, bench terracing, grassed water ways, gully rivetment structures, etc.) and vegetative (grass cover, pasture development, special anti-erosion crops, etc.).
- Water harvesting methods (check dams, farm ponds, percolation tanks, etc.).

Following the pioneering work done by Sukhomajri, watersheds have been developed at several locations all over the country using specific measures suited to their particular conditions. At most of these locations the change has been quite dramatic within the space of less than a decade — remarkable improvements in crop yields, a significant degree of ground water recharge, as well as a strikingly enhanced capacity to withstand drought conditions — facts acknowledged even by the Government. **By going ahead with the NVP, we could be setting into motion a process of such irreversible change and destruction that the adoption of this alternative strategy in the Narmada basin could be ruled out forever.**

It is imperative, therefore, that the Government of India :

- Urgently initiate a fresh cost-benefit calculation for the projects including both its potential costs and benefits.
- Vigorously pursue the implementation of appropriate location- specific programmes of dryland watershed development in the concerned states of Madhya Pradesh and Gujarat.

Meanwhile we appeal to the Government of India and the Governments of Gujarat and Madhya Pradesh to stop all further work on the Narmada Valley Project."

The signatories to the above Memorandum included:

Medha Patkar, Narmada Dharangrast Samiti, Dhule;

M.N. Buch, Chairman, National Centre for Human Settlements and Environment, Bhopal.

Anil Aggarwal, Director, Centre for Science and Environment, New Delhi;

Dr. M.S. Swaminathan, President, International Union for Conservation of Nature and Natural Resources.

Eminent Scientists : Obaid Siddiqi, President, Indian Academy of Sciences; M.S. Raghunathan, mathematician; E.C.G. Sudershan, theoretical physicist; Satish Dhawan, former Chairman, Indian Space Research Organisation; L.S. Srinath, Director, IIT Madras; M.K. Pai, Director, Saha Institute of Nuclear Physics, Calcutta; V. Radhakrishnan, Director, Raman Research Institute, Bangalore; Arvind Kudchadker, Deputy Director, IIT, Bombay; C.V. Seshadri, Director, Murugappa Chettiar Research Centre. Madras, P.V. Sane, Director, National Botanical Research Institute, Lucknow; A.K. Barua, Director, I.A.C.S., Calcutta; Professors R. Narasimhan, TIFR, Bombay; S.K. Sinha, IARI, New Delhi; C.S. Seshadri, Mat Science, Madras; Suhas Sukhatme, IIT, Bombay and T.V. Ramakrishnan, P. Ganguly and K.S. Gandhi, Indian Institute of Science, Bangalore.

Public Figures : Achyut Patwardhan, Aruna Asaf Ali, V.R. Krishna Iyer, the late Kamladevi Chattopadhyaya, Malcolm Adiseshaiani, V.M. Tarkunde, C. Subramaniam, I.K. Gujral, Lt. Gen. S.K. Sinha (Retd.), Mrinalini Sarabhai and P.G. Maalankar (the last two withdrawing their names under pressure from the Chief Minister of Gujarat!)

Senior Administrators : P.N. Haksar, former

Principal Secretary to the Prime Minister of India; Kamala Choudhary, former Chairman, National Wastelands Development Board; Lakshmeshwar Dayal, former Chief Secretary, Bihar; N.M. Trivedi, former Chief Conservator of forests, Madhya Pradesh; Jitendra Bahadur, former Chairman, Ganga Flood Control Commission; C.P. Joshi, Chairman, J.P. Electronics Corporation; K.N. Sahaya, Mayor of Patna; P.S. Bapna, former Development Commissioner, Madhya Pradesh; R.C. Pant, former Secretary, Government of Uttar Pradesh; N.P. Sen, former Principal, Administrative Staff College of India, Hyderabad and B.P.R. Vithal, former Finance Secretary, Andhra Pradesh.

Social Scientists : Irfan Habib, M.L. Dantwala, Romila Thapar, N.R. Sheth, Krishna Bharadwaj, Deepak Nayyar, A.R. Desai, Ravinder Kumar, C.T. Kurien, B.K. Joshi, Ranjit Sau, Nirmal Chandra, R.M. Honavar, D.D. Narula and A.K.N. Reddy. University vice chancellors — past and present — included M.S. Gore, Bombay, S.K. Sen, Jadavpur, Calcutta, Bhabatosh Chatterjee, Rabindra Bharati, Calcutta, K.K. Dave, Vikram, Indore and Sagar, Madhya Pradesh, G.P. Sinha, Patna, S.N. Jha, Lucknow, Vasanthi Devi, C/o Mother Theresa, Kodaikanal, and Kansingha, Jodhpur.

Noted figures from the fine arts — music, film, dance, theatre, paintings and literature : Kumar Gandharva, Amjad Ali Khan, Satish Gujral, Shyam Benegal, Vijay Tendulkar, Sivaram Karanth, Nissim Ezekiel, Adoor Gopalakrishnan, Aravindan, Alyque Padamsee, Mahasveta Devi, Raghu Rai, Shivmangal Singh Suman, Chandralekha and Jehangir Sabawala.

Environmentalists and Social Activists: Sunderlal Bahuguna, Rajni Kothari, Vice Admiral M.P. Awati (Retd.), N.D. Jayal, C.R. Krishnamurthy, Zafar Futehally, S.P. Godrej and T.N. Dhar.

Lawyers : Soli Sorabjee, L.M. Singhvi, S. Govind Swaminathan, Rajinder Sachar and Upendra Baxi.

Journalists : S. Mulgaokar, Cho. Ramaswamy, Kuldip Nayar, Krishna Raj, N. Ram and Chanchal Sarkar.

BIG DAMS

- A Critique

1) **Damming the Narmada** - India's Greatest Planned Environmental Disaster by Claude Alvares & Ramesh Billorey. 196 pp. Rs. 40/- Pub : TWN/APPEN, Malaysia.
[In addition to the main investigation piece, the book also includes interviews with former NVDA Chairman Verma, other officials, plus damning studies and evaluations made by Govt. departments themselves, specially the DOE]

2) **Evaluating the Tehri Dam** by Vijay Paranjpe. Pub : Indian National Trust for Art & Cultural Heritage, 71, Lodhi Estate, New Delhi - 110 003

3) **The Narmada Valley Project** : A Critique. 24 pp, Rs. 10/- Pub : Kalpavriksh.
[The environment group whose study on the Narmada project first alerted the world to the project's implications, now brings all its arguments together in a little booklet]

4) **In Sorrow And Anger** - The Victims Speak. 50 pp, Rs. 10/- Pub : CAISA
[Based on a visit to the area to be submerged by the Narmada (India) Sagar Project]

5) **Dams and other Major Projects** : Impact on and response of indigenous people. Publ : C.C.A. - U.P.M. (Report of a workshop, 8-12 April, 1988, at Goa, India)

6) **Wet Deserts** : The Impact of Canal Irrigation, by Sudhirendra Sharma, 25 pgs, Rs. 20/- Publ : E.E.G. (A Report/study of some areas where inappropriate canal irrigation schemes have led to water-logging. "The government is marching ahead to water-log the entire nation!")

Ecological Alternatives for India's Development

There can be little doubt that one of the biggest tragedies of our times has been our failure to appreciate the very close nexus which exists between poverty and poor management of natural resources.

A situation exists where, on the one hand, the basic life-support systems have already suffered grievous depletion and damage and are unable to cope with their existing burden, while on the other hand, the pressures to which they are being subjected, continue to mount relentlessly.

i. The country possesses only around 266 mh of land which have any potential for biotic production. Out of this area, at least 90 mh, or over a third, are so badly degraded that they have already gone out of production as a result of denudation or water-logging and salinisation, etc. These lands must be reclaimed and restored to whatever production they are capable of, even though this may be in the form of trees or shrubs or grasses.

ii. Around 85 mh, or almost another one-third of the area, suffer from degradation to some extent or other and can be described as only partially productive. These lands form part of 143 mh which are under cultivation, and must be saved from further deterioration – whether caused by soil erosion or salinisation — in the interests of safeguarding the country's food production potential.

iii. Of the 67 mh which are officially notified as 'forest lands' under one section or another of the Indian Forest Act, not more than around 28 mh possess good natural forests (with a crown cover of at least 40%). Such forests are being lost at the rate of at least 1.5 million hectares per annum and must, under any circumstances, be saved from further depletion.

iv. The incidence, as well as the severity, of both droughts and floods are increasing because of the growing deforestation and denudation in water-sheds.

v. Water-logging and salinisation of the soil had already claimed 13 mh of once-productive agricultural lands by 1980. The present position is bound to be much worse.

vi. Although very large investments have been made on big irrigation projects, their productivity continues to be disappointingly low. This situation can be improved only if more attention is paid to command area development programmes than to the construction of new projects. Such a major change in policy is however something that irrigation establishments are still reluctant to accept, in spite of the fact that big new projects have long ceased to be either cost-effective, or ecologically desirable.

vii. Ground water levels have fallen dramatically in most intensively-cropped areas of the country, thus showing that withdrawals have exceeded recharge levels. There is urgent need to regulate pumping in such area and to pay greater attention to problems of recharge.

viii. The per capita availability of agricultural land which stood at 0.48 hectares in 1951 will be reduced to 0.14 hectares in the year 2000 A.D. Good agricultural lands must, therefore, be zealously guarded against depletion and degradation.

There is now no option but to take necessary steps to redress the balance in favour of land management by preventing the excessive run-off losses on denuded slopes. This will also result in the increased replenishment of the ground-water resources which today serve a larger area than big projects and are nearly 100% more productive in terms of agricultural yields per hectare. The new policy will also result in better use being made of existing irrigation potential, in improved drainage in commands where water logging is a threat, and in the enhancement of the productivity of nearly 175 mh of degraded lands both agricultural and non-agricultural. Above all, it will save endangered reservoirs from premature siltation, and help to curb the incidence and severity of the recurring floods and droughts.

Such changes in policy are essential alongside efforts at afforestation, watershed management and soil and water conservation.

Since the dependence on the forces of natural regeneration is fundamental, it is absolutely essential to restore and enhance the cover on lands. Two preconditions exist: First, the areas which are sought to be regenerated must be effectively protected against grazing. Secondly, and particularly in areas of moisture scarcity, there must be effective soil and water conservation programmes like contour trenching and the construction of check dams and small storages in

The State of India's Environment

- India is rapidly becoming a vast wasteland. Between one-third to one-half of the country (100-150 million hectares) is deteriorating into a desert.
- India hasn't yet become an Ethiopia only because its vast and extremely rich Indo-Gangetic Plains continue to yield despite all kinds of environmental mismanagement.
- Excellent soils, lots of sunlight and water are the attributes which make India one of the richest countries in the world in terms of its potential productivity. But once the land is denuded, nature turns upon itself.
- On an average, every hectare loses 20 tonnes of top soil every year. Every six months, more top soil gets washed away than has been used to build all the brick houses across the country.
- The Green Revolution pulls out more plant nutrients from the soil than it puts back. Ludhiana district, which records the highest yields of many crops, now also records the highest deficiencies of plant micronutrients in its soils.
- Between a quarter to a half of the lands brought under irrigation can go out of cultivation permanently because of soil salinity and waterlogging.
- India has invested over Rs. 10,000 crores in 1500-odd large dams. Yet average yields from irrigated lands remain less than two tonnes per hectare. The flood prone area has doubled over the last ten years from 20 million to 40 million hectares. And millions of people have been displaced and uprooted.

(Highlights from the presentation by the Centre for Science & Environment to the Union Council of Ministers, May 21, 1986)

***Note :** An excellent detailed study may be found in 'The Second Citizens' Report on the STATE OF INDIA'S ENVIRONMENT, 1985, published by the Centre for Science & Environment, New Delhi.*

all mini-catchments in order to give a chance for plants to survive. If all precipitation is conserved by effectively controlling run-off losses, there can be adequate moisture to sustain grass and trees during the drier years.

Both these conditions can, however, be satisfied only if the local administration and local communities join hands in controlling grazing by domestic as well as by nomadic herds and cooperate in carrying out soil and water conservation work on a massive scale on all denuded lands. This will require the education of local communities in the benefits to be obtained from better resource management and ensuring that such benefits actually flow to them in an equitable manner. Such an approach will also demand that soil and water conservation works and natural regeneration should henceforth constitute the core of all rural development programmes and that the funds which are at present being used on a large variety of employment guarantee, poverty alleviation, and other schemes are diverted to such works on a priority basis.

In view both of the nature of the works required to be carried out in the field of land management as well as of the need to actively involve local communities in their execution, it is necessary to decentralise various decison-making processes and bring them as near to the ground as possible. Works like levelling and terracing of land, trenching and bunding, construction of small check dams and storages, digging of drains

and planting of trees and grasses are such that, given a modicum of technical guidance, can be generally carried out by local communities without bringing in outside contractors and labour. Village communities could ideally exercise the necessary initiatives and leadership in this field. However, most such communities are, by and large, feudal and fragmented and not egalitarian and homogenous in structure. They are also often dominated by muscle men and mafias and have become distrustful of authority. Again, they enjoy little autonomy, have access to no financial resources and possess no viable institution for democratic self-government. Without far-reaching political, administrative and social changes in the entire rural sector, better resource management will remain only a distant dream. But this task must be accomplished, however formidable it may be.

The battle for survival will be ultimately won only by appropriate action at the grass roots level. Village by village, micro-watershed by microwatershed, field by field steps will have to be taken to enthuse local populations to participate in programmes to improve the productivity of all available land and water resources, so that the future may be secured.

—B.B Vohra

('People's Action, Sept.' 88, published by C.A.P.A.R.T. (Council for Advancement of People's Action and Rural Technology), Guru Nanak Foundation Building, New Meharuli Rd., New Delhi - 110 067. Shri Vohra is chairman of the Advisory Board on Energy, New Delhi).

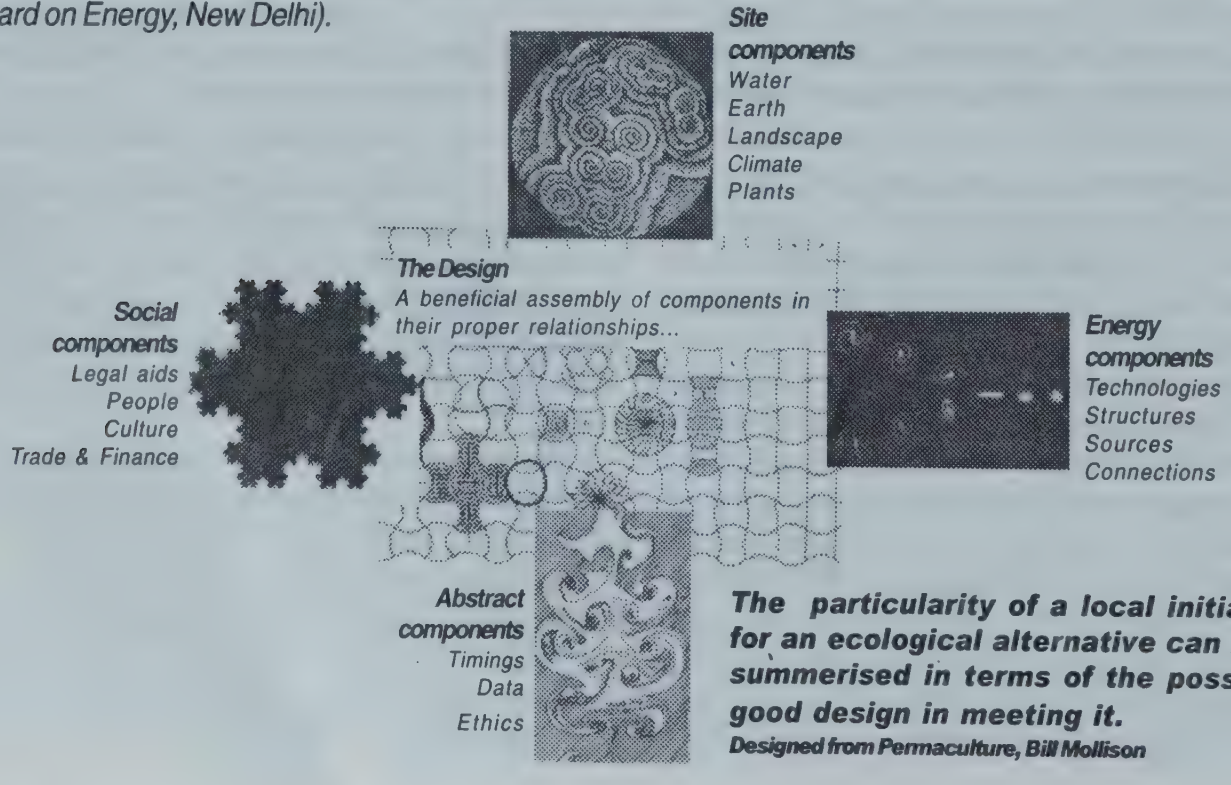
•... If we take a head count at this stage, we will find that the destruction of the environment and its transformation is already affecting on an immediate and on a daily basis at least the following groups: artisans, nomads, tribals, fisherfolk and women from almost landless, marginal- and small- farming households. These groups add up to no less than half to three-quarters of the country's entire rural population. And unlike the situation in the West, the question of environmental destruction is not an issue related to the quality of life but it is a question of survival.

—Anil Agarwal

(Front 'Beyond Pretty Trees and Tigers: The Role of Ecological Destruction in the Emerging Patterns of Poverty and People's Protests')

• ... Probably no other group is more affected by environmental destruction than poor village women. Every dawn brings with it a long march in search of fuel, fodder and water. It does not matter if the women are young, old or pregnant: crucial household needs have to be met day after weary day. As ecological conditions worsen, the long march becomes ever longer and more tiresome. Caught between poverty and environmental destruction, poor rural women in India could well be reaching the limits of physical endurances.

—C.S.E. Report ('84-'85)



The particularity of a local initiative for an ecological alternative can be summerised in terms of the possible good design in meeting it.

Designed from Permaculture, Bill Mollison

Appropriate Earthworks

(On swales - the simple, labour-intensive and highly cost-effective measure for checking sheet run-off of soil and water, for re-charging ground water. Swales, combined with the planting of trees, shrubs are the urgently needed alternatives, appropriate for re-generating huge tracts of land.)

There are two basic strategies of water conservation in run-off areas: the diversion of surface water to impoundments (small dams, tanks) for later use, and the storage of water in soils. Both result in recharge of ground water. As with all technologies, earthworks have quite specifically appropriate and inappropriate uses. Some of the main productive earthwork features we create are as follows:

- Small dams and tanks (storages);
- Swales (absorption beds);
- Diversion systems or channels;
- Irrigation layouts, and in particular those for flood or sheet irrigation.

Ground Water Infiltration Via Earthworks

Cheap broadscale earthwork systems, and many minor forms of earthworks can aid the infiltration of overland water-flow. Swales, pitting, and water spreading are the main aids of getting fresh water to deeper storages in the soil for long-term use, and also to increase base-flow. Swales also arrest the run-off of topsoil, and combined with tree-planting, help to re-generate the land.

Contour Swales

Swales are long, level excavations, which can vary greatly in width and treatment from small ridges in gardens, rock- piles across slope, or deliberately-excavated hollows in flatlands and low-slope landscapes (see fig.)

Swales on contour do not flow; they first stop and then infiltrate overland flow. Swales on hillsides are part of access or production systems.

Swales are intended to store water in the underlying soils or sediments. They are, simply, cross-flow dry channels or basins intended to totally intercept overland flow, to hold it for a few hours or days, and to let it infiltrate as Groundwater Recharge into soils and tree root system. **Trees are the essential components of swale planting works**, or we risk soil waterlogging and a subsequent local rainfall deficit caused by lack of evapo-transpiration of the stored water. Tree planting must accompany swaling in arid areas. Thus, in addition to ground water re-charge, the halting and absorption of run-off also convert water from a destructive erosion force into a quieter life-creative energy to develop forests.

Swales are therefore widely used in arid to sub-humid, even humid areas, on both fairly steep slopes and flatlands, and in both urban and rural areas. They are appropriate to road and other silty run-off harvest.

The essentials of swale construction are simple; they are all built on contour or dead level survey lines, and are neither intended nor permitted for water flow. Their function is just to hold water. Unlike dams, swale banks and bases are never compacted or sealed. Conversely, the swale soils can be gravelled, conditioned or loosened to assist water infiltration. The swale depth and width can be varied to cope with the speed of infiltration locally, so that wider and shallower swales are made in sands, narrower and deeper swales in clay-fraction soils.

After an initial series of rains that soak in a metre or more of water run-off, trees are seeded or planted on either bank or side slopes of the swales. This can take two wet periods. Thereafter, it takes about 3-5 years for tree belts to overshade the swale base, and to start humus accumulation from leaf tissue.

Early in the life of an unplanted swale, water absorption can be slow, but the efficiency of absorption increases with age due to tree root and humus effects. As this happens, it is possible to admit water to swales from other areas, leading it in via *Diversion Drains*. This water from rock surfaces or overland flow can enable the planting of high-value trees of higher water demand or a new set of swales to be constructed.

Every sub-humid and arid townscape can, with great benefit fit all roads and paved areas with swales, along which tree lines shade pavements and reduce heat build-up while they produce fuel, mulch, and food products.

In arid areas, it is imperative to plant trees on swales, or we risk salt concentration and soil collapse downhill. All swales are therefore temporary events, as trees supplant their function; they are precursors to rehabilitation of normal forests in their region. Natural swales in humid forests not only generate much larger trees, but support a thick humus and, specialised plants on the swale floors.

The distance between swales (the run-off or mulch-planted surface) can be from three to twenty times the average swale width (depending on rainfall). Given a useful swale base of 1-2 m (4-6ft), the interswale space should be 3-18m (12-60ft). In the former case, rainfall would exceed 127cm (50 inches), and in the latter it would be 25 cm (10 inches) or less. In humid areas, the interswale area is fully planted with hardy or mulch-producing species. In very dry areas, it may be fairly bare and exist mainly to run water into swales.

Mulch blows into, can be carried to, or is grown and mown in swales. Fine dust and silts build up in swale bases, and domestic wastes can be burried here as a mulch-pit for hungry plants. The swale and its spoil-bank make a very sheltered starting place for plants on windy sites, and the lower slope swales on such windy sites can be planted mainly to Casuarina or leguminous trees to prevent upslope winds. Ridges should always have windbreak and condensation plants of hardy and useful species (Casuarina, Acacia, Leucaena, silky oak, pine, cypress). Wind-breaks can occupy every sixth to tenth swale on sites where wind is a limiting factor. It is better to plant on the downslope side to allow mulch collection in the swale base for use elsewhere.

• Soil Storages Via Soil Conditioning

"Soil conditioning provided it is followed by tree plantation, element additions, and non-destructive agriculture of well-managed natural yields, sparse grazing, and conservation farming increases (by factors of upto 70 - 85%) the ability of soils to hold and infiltrate water. Areas up to 85% run-off can be converted to zero overland flow by a combination of soil conditioning, swales, and water spreading to forests."

"As soils can contain many times the water of open storages or streams, then both the throughflow, baseflow, and, water available for plants also increases. Soil treatments now need to precede tree planting over almost every area that has been used by contemporary agriculture. In particular, the barren areas used for constant cropping in dryland areas need soil treatment to initiate water absorption. Trees are essential to prevent water-logging of soils and soil salting in the long-term.

For the serious small dam and earth tank builder, there is no substitute for such comprehensive texts as that recently compiled by *Kenneth D. Nelson (1985).* This small classic deals with catchment treatments, run-off calculations, soils, construction, outlets, volume and cost estimates, and includes detailed drawings for most adjunct structures.

However, like most engineers, Nelson concentrates mostly on valley dams (barrier or embankment dams), and less on the placement of dams in the total designed landscape. Few dam builders consider the biological cape design in modern times.

A second essential book for water planning in landscape is P.A.Yeoman's 'Water for Every Farm/ The Keyline Plan'(1981). This very important book, written in 1954, is without doubt the pioneering modern text on landscape design for water conservation and gravity-fed flow irrigation. As it also involves patterning, tree planting, soil treatment, and fencing alignment, it is the first book on functional landscape design in modern times."

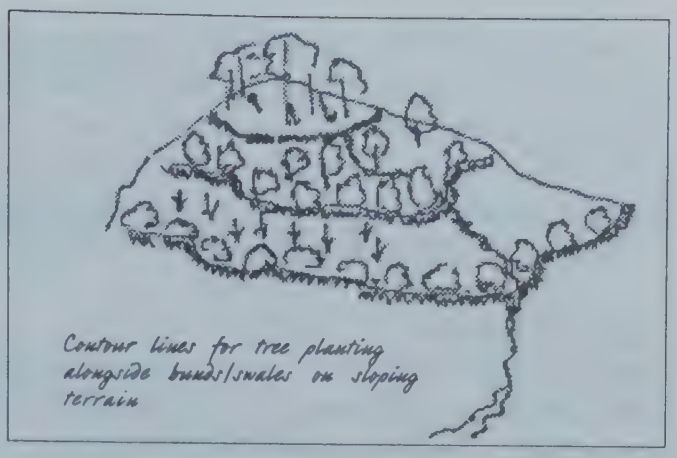
"We should always do our sums and keep good records, for if we withdraw freshwater from the groundwater storage faster than we can recharge it, we are only temporary inhabitants of the desert. Thus our uses must be frugal, needful, and devoted primarily to establishing deep-rooted and drought-resistant trees, not to supply wasteful lawns, flush toilets and leaky pipes."

Swale sections can be over-deepened, so that although the swale lip is surveyed level, its floor may rise and fall. Deepening is most effective in clay fraction soils, and may result in shallow ponds for water-needy crop. Widening is most effective in sand or volcanic-fraction soils, and readily admits water to the ground table.

In conclusion, swales are simple technology earth-works that are appropriate to a wide variety of situations. They play a vitally important role in re-generating the land.

— Bill Mollison

*(**Bill Mollison** is the pioneering force behind "Permaculture" which aims at functional design of landscapes so that they evolve as stable eco-systems and provide high yield for meeting a wide variety of human needs. He received the Right Livelihood Award (or Alternative Nobel Prize), and has authored the valuable hand book : 'Permaculture - A Designer's Manual.' He has travelled extensively and has taught a few thousand people through his intensive work-shops on Permaculture design, which have been conducted in all the five continents. In '87-88, he supervised the laying of several kilometres of swales in the Kalahari, Botswana.)*



Swale or Pond

In soil with less than 45% clay, make swales. If the soil is compacted with more than 45% clay, we can make ponds.

Don't use ponds where evaporation exceeds rainfall. We don't want ponds in the open desert, because they will become salt pans. Ponds are good only for humid climates.

If you want to make a swale in clay, crack the clay and add gypsum. Then you can get water to percolate 2m down.

Baliraja Dam

(Small, people-oriented, ecologically sound, and cost-efficient)

The people of 2 villages, Balwadi & Tandulwadi, on the banks of Yerala river in drought-prone Sangli district are co-operating in the construction of the Baliraja Dam, which, when completed will create history. It will be the first dam built by the initiative of the villagers.

Unlike big dams, Baliraja neither displaces people nor submerges fertile agricultural land or forests.

The villagers, hit by a severe drought in '83 were spurred to find a solution to recurring drought and famine. Relief work was no answer. An alternative had to be found. Could drought be prevented and its impact reduced ? A 10 day *Vigyan Yatra* in '84 covered 11 villages in the Khanapur-Vita Tehsil. Organised with the help of the People's Science Movement, it sought to create awareness on the causes of drought and to look for a long-term solution.

"We looked at all aspects: rainfall pattern, falling water table, deforestation, geological conditions, and loss of vegetation cover. A survey we conducted revealed that in '72 there were only 522 jackwells in the area. In '82 they exceeded a staggering 22,000, and now stand at a phenomenal 25,000.

Earlier the water-level was 30 feet underground. Now, borewells have to be dug to a depth of 200 feet to reach the water.

The villagers decided to take initiative in their hands and build a small dam of their own, raising funds through sale of sand from the dried up river bed. Construction began on Nov.'83. The cost estimate, initially Rs. 3.09 lakhs, has now shot up to 4 lakhs. Water in the catchment area will be used for protective irrigation that will assure one non-water intensive crop like jowar and ground nut to each family. It has been agreed that every adult of Balawadi and Tandulvadi, irrespective of land holding, sex and caste, will have equal right to their share of water.

Ironically, just 3 km down the Baliraja is the site of the Vajar Dam which is proving to be a white elephant for the government. Started in '84 at an estimated cost of Rs. 56 lakhs, its cost has already escalated to Rs. 87 lakhs. The dam will probably take another 4 years to complete, and the cost may well soar to Rs. 1 crore. The dam is built on a design totally unsuitable for this terrain. An official on the site sheepishly admits that siltation will make it unworthy of use in just 3 to 4 years.
— Saroj Iyer *(People's Action, CAPART, 1988)*

Victory at Baliraja

Sunday March 5, 1989 was a special day for the people of Balwadi and Tandulvadi, and all those concerned with alternative water management systems in drought-affected areas. The celebration marked the completion of the first stage of the Baliraja dam, across the river Yerala, a tributary of the Krishna river. Friends and supporters of the cause streamed into the little village from early that morning on foot, in jeeps, and trucks. With the local people they marched to the dam site where the first of the four sluice gates was inaugurated. Young and old, host and guest participated in shramdan in a symbolic gesture of struggle and solidarity. Already, other villages in the area have expressed their interest in replicating the dam.
Shanti Kurian (Land & Water Review, April 1989)

Adgaon Project

Towards appropriate land and water management

The Maharashtra Sheti Sahaya Mandal has been extending good ground support to villagers in their effort at integrated land and water management. Their contribution lies in demonstrating alternative strategies for more efficient water conservation, using technology that is appropriate to the needs of the people and which aids re-generation of the land. The Mandal particularly offers its skills and ground experience in helping people build earthworks like small dams suitable to their region.

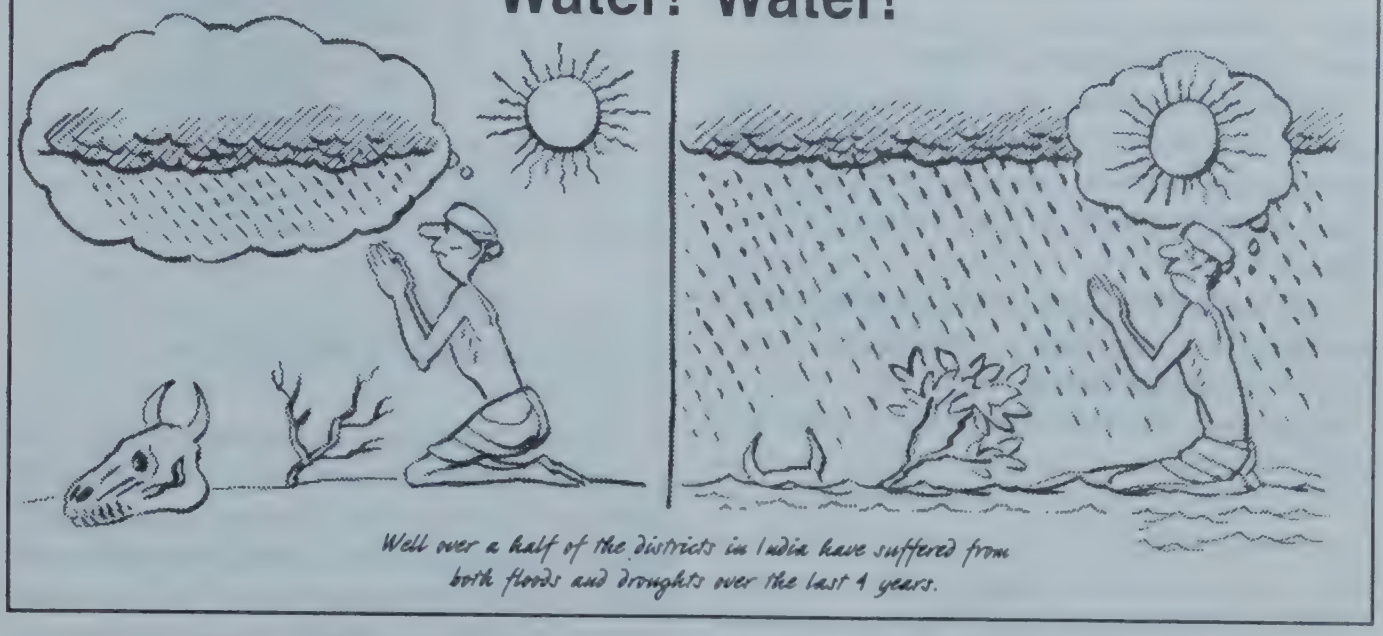
However, the most outstanding feature of these efforts at water-conservation is the popular participation mobilised towards efficient and equitable use of the water so conserved.
In 1985, some people of drought-prone Adgaon approached the Mandal for help. A survey of the region, followed by consultations with the people indicated that soil and water conservation was the only way to break the endless cycle of water scarcity, crop failure and poverty.

The Adgaon Project that developed took up programmes for water harvesting and surface water development through construction of 'checkweirs' and earthen dams. Soil conservation measures by means of 'gully plugs', and 'contour trenches' were given high priority. These also helped in re-charging ground water. Side by side with these simple earth-works, a drive was undertaken to promote afforestation and agro-forestry. Other efforts included dry-land treatment and development of suitable non-conventional energy sources.

These programmes have been an important step in re-generating the land and have significantly contributed in improving the living conditions of the villagers through increased farm yield. Much, however, yet needs to be done. Building further the awareness relating to proper utilisation of water and trying out some of the alternative strategies in ecological agriculture (without dependence on chemicals) are important areas where more work is desired.

(A detailed account of the Adgaon project co-authored by K.R. Datey, Suhas Paranjpe, R.K Patil and S.B. Suryavanshi has been published in 'Land and WaterReview', April 1989. This quarterly joumal is being brought out by People-Oriented Water Utilisation (POWU) C/o. Kiran More, 91 Mistry Park, B. Desai Rd, Bombay 400 036)

Water! Water!



Well over a half of the districts in India have suffered from both floods and droughts over the last 4 years.

India is one of the world's richest countries in terms of its water resources.

The average annual precipitation in India is higher than that of every other continent in the world except that of South America and twice that of the average annual precipitation of the continent of Asia.

Annual Precipitation (mm)

South America	1596
India	1150
North America	808
Europe	769
Africa	725
Asia	630
Australia	455

The biggest problem with India's water resources is that they bless us during a very short period of the year. Over three-quarters of the country's rainfall comes pouring down within the four monsoon months of June to September.

There is, thus, a natural tendency within the country's environment to witness uneven availability of water over the year. In extreme forms, this takes the shape of floods during the four monsoon months and droughts during the eight dry months.

But nature has provided us with several cushions to even out this imbalance in water availability. Firstly, the vast tracts of forests that we had would hold back the monsoon waters and release them steadily like a slow-release valve into the rivers, streams and groundwater systems. Secondly, in all those parts of the country where we have massive groundwater aquifers, rainwater gets stored in substantial quantities for use by people later through wells. Thirdly, the people help themselves by designing systems like ponds, tanks and dams to capture some of the monsoon waters for use during dry months.

Ironically, whenever there is a drought, the biggest demand is to sink more tubewells and borewells and draw more heavily on groundwater.

This literally amounts to discounting the future–forsaking the rights and needs of future generations.

Groundwater exploitation in dry areas must be accompanied by adequate afforestation and groundwater recharge measures.

In some places, groundwater reservoirs must be maintained as groundwater sanctuaries to be used only for drinking water during periods of acute drought.

Equity in water distribution

Equity in the distribution of irrigation water will greatly help to increase protection from drought and famine.

Eleven out of 25 districts in Maharashtra face acute shortages of water. But in all these districts, the scarce irrigation water is being used, to irrigate very small areas creating islands of prosperity surrounded by areas of water scarcity-induced poverty. Sugarcane is particularly a crop that uses enormous quantities of water.

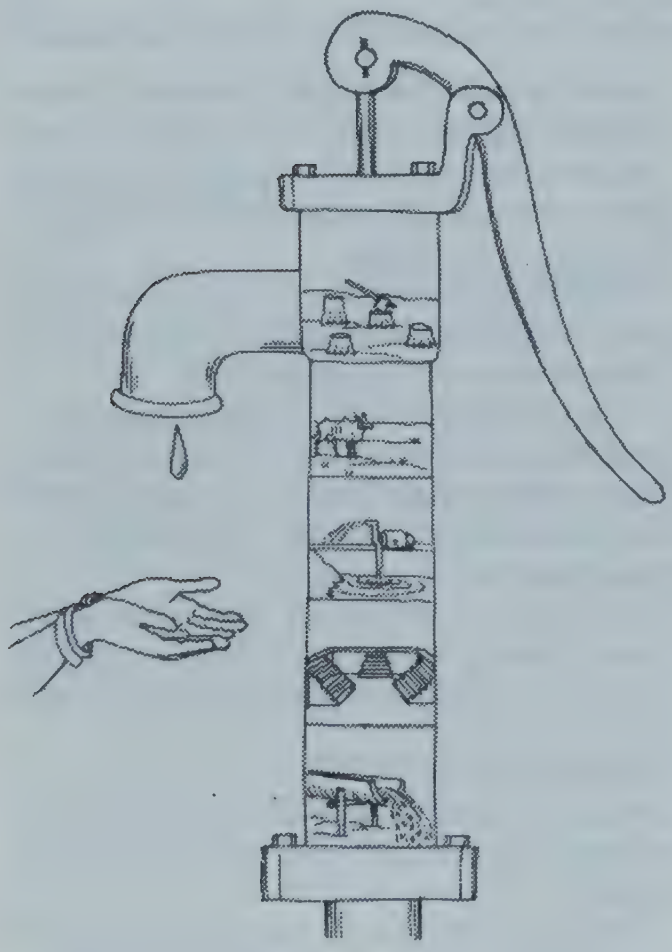
Instead of giving water to farmers for a specific cropping pattern, each farmer should be assured a fixed quantity of water in proportion to the land owned, say, 2500-cubic metres per hectare (about

10 inches depth of irrigation). The farmer can then choose the cropping pattern but this will induce the farmer to be careful in his use of water.

In drought-prone areas, even a single irrigation of just 50 mm. (2 inches) depth can spell the difference between crop failure and a reasonably good crop. This is the essence of protection from drought failure.

In arid areas like Ladakh, people traditionally shared irrigation water on an equitable basis and, thus, ensured social stability.

Extracts from the *'The Wrath of Nature'*, Pub. CSE.



We often tend to forget that water is one of the most effective instruments for harnessing solar energy. A hundred millimetres of water, applied strategically, could give five tonnes of biomass and another tonne or two of brushwood biomass.

— K.R. Datey

Grass Root Action

In 1972, Maharashtra had a severe drought. The anti-drought strategy that came from the top was based on the view that nature was deficient and people's technologies were backward. The environment had to be protected from nature and from people's primitiveness. The prescription that emerged from a partnership between the World Bank, the government, and the "sugar barons" was the drilling of deep tubewells for energised pumping of water. Intensive technology and financial inputs led to a more intensive use of scarce water resources for the production of irrigated sugarcane. The result was less water for staple foods and drinking, and, a deepening of the crisis of desertification and survival.

There was a second strategy that emerged in Maharashtra to fight drought, built on diverse initiatives like Pani Panchayat, Mukti Sangarsh, and communities like those of Ralegaon Shindi. They were based on the perception that the environment and people had to be protected from over-exploitation by the elite for water-intensive cash-crops production like sugarcane. Through the mechanism of collective social control, these initiatives banned the cultivation of sugarcane as the first step in desertification control and water conservation. As a second step, they used collective labour to harvest rainwater and provide water to all for drinking and protective irrigation. The people's strategy was based on political and social organisation for environmental protection, not on capital and technology-intensive inputs. For sugarcane farmers, it led to a loss, but the ecosystem and poorer farmers gained.

— Dr. Vandana Shiva
Research Foundation for Science, Technology & Natural Resource Policy
105, Rajput Rd.
Dehradun - 248 001.

Floods

The flood-prone area in the country has been increasing dramatically.

The National Flood Commission had estimated in 1978 that the flood-prone area had increased from about 25 million hectares at the end of the 1960s to about 40 million hectares by the mid-1970s.

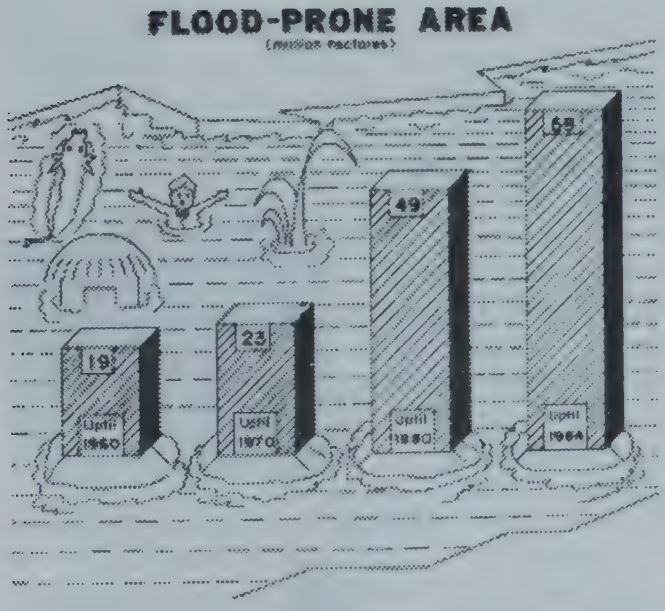
Using the same methodology of the National Flood Commission, we find that the flood-prone area in the country is now 59 million hectares —an extraordinary increase in just six years since 1978.

The National Flood Commission had stated that its methodology of calculating the flood-prone area underestimates it. And, as past experience goes, even those areas which are claimed to be protected from floods, can get flooded. Therefore, the flood prone area in the country today must be at least 65 million hectares.

Many new areas are becoming flood-prone.

Before the 1970s, UP, Bihar, West Bengal, Orissa and Assam accounted for over 60 per cent of the area affected by floods.

In the 1970s, new states like Andhra Pradesh, Madhya Pradesh, Maharashtra, Tamil Nadu, Rajasthan and Gujarat were also getting flooded. In addition, new areas are getting flooded even in traditionally flood-prone states like Uttar Pradesh, Bihar and Orissa.



Water Crisis in America !

America is entering a crisis in water, one that is every bit as serious, and a good deal more far-reaching, than our current energy predicament. Water, which has been considered a free good - a substance to be taken, used, and disposed of with scarcely a thought - is becoming valuable. There'll always be plenty of it, but our supplies of usable water are seriously threatened. The crisis has come on us suddenly, catching our politicians, scientists, and engineers unawares. Vast portions of our underground water supplies, once thought of as incomparable in their purity, are turning out to be tainted by toxic wastes from industry and agriculture pollutants (chemical herbicides, pesticides and fertilizers). Rain often falls now as acid as vinegar. Not all our problems have to do with quality; in many areas of the country, particularly the West, we are pumping more water out of the ground than goes into it, even to the point where the earth's surface is caving in.

It is not just the U.S.A., but the whole world that is now entering a period of water crisis.

While providing alarming details on the coming crisis, this book also explores water itself - its nature, where it comes from, what we do with it, where it goes - and explains the politics and economics of water, as well. The cost of water is playing an increasingly important role in determining what foods we eat and what crops we grow, how and where we live and make our living. We will never again be able to think of water as a free good, a basic human right.

Not all the prospects are dismal ones. Powledge finds, in extensive travels around the country, that ordinary citizens - old, young, female, male, and of every political philosophy - are banding together to defend the quality and quantity of their water. Armed with the body of environmental law that has developed in recent years, and schooled in the tactics of bureaucracy-fighting, these Americans may succeed in persuading their leaders to protect the very substance that keeps us all alive.

Extracts from the cover jacket highlights of 'Water' by Fred Powledge, published by Farrar Straus Giroux. (423 pp).

'Powledge has powerfully marshalled one of the most serious warnings in modern history.'

— Michael H. Brown, author of '*Laying Waste*'

· *Water is the driving force of all nature.*
– Leonardo Da Vinci

· *Water under the ground has much to do with rain clouds. If you take the water from under the ground, land will dry up'.* *– Hopi Saying.*

· *Perhaps rain falls from above meteorologically, but philosophically it falls from below. If there is vegetation on the ground, then water vapor rises here, condenses into clouds, and falls back down to earth as rain.* *– Fukuoka*

· *In an animal or a plant, 99 molecules in 100 are water... An organism is a pool in a stream of water along which metabolites and energy move through ecosystems.*
– W. V. Macfarlane

· *A small proportion of the water in the air may fall as rain (15-20%), but most of the water is condensed out of clear night air or fogs by the cool surfaces of leaves (80-85%). Of this condensate, 15% evaporates by day and 50% is transpired. The rest enters the groundwater.* ***Thus, trees are responsible for more water in streams than the rainfall alone provides.***
.... If we clear the forest, what is left but dust?

Appropriate Irrigation/Water Harvesting

(1) **Water for Every Farm/Using the Keyline Plan** by P.A. 281 Yeomans. Pub: Second Back Row Press, Australia [Another classic. It is the pioneering modern text on landscape design for water-conservation, and gravity-fed flow irrigation. Also covers patterning, tree planting, soil treatment and fencing alignment]

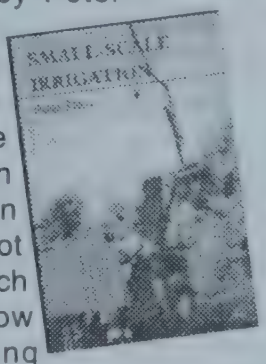
(2) **Shaping Your Land** by G.G. Sohani, pp. 10, Rs. 5/- Pub:BAIF
[All about land management, control of erosion and contour bunding. Practical tips and easy-to-follow illustrations]

(3) **Rainwater Harvesting** - The collection of rainfall and runoff in rural areas by Arnold Pacey with Adrian Cullis, 224 pp. Pub: ITP
[Excellent for rural development workers who are involved with water resources for domestic and agricultural purposes]

(4) **The Operation & Maintenance of Small Irrigation Schemes** by Peter Stern. 48 pp, Pub: ITP
[Quality in organisation of maintenance can be the single most important factor in the success of irrigation schemes. Deals with problems of operation & maintenance at the sources of supply, in the conveying of water, in distribution both on & off farm-as well as advising on drainage, health and general management problems]

(5) **Groundwater Dams for Small-scale Water Supply** by Ake Nilsson., 64 pp. Pub: Intermediate Technology Publications.
[Methods described in this book are simple and inexpensive and therefore suitable for application in connection with water supply schemes in rural areas in developing countries. Planning and investigation methods are described, as are the design and construction of two types of dams]

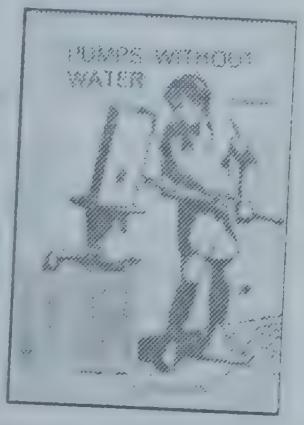
(6) **Small-scale Irrigation** by Peter Stern, 176 pp, Pub: ITP
[This excellent & clearly illustrated book has been written primarily for those working with farmers on development and extension in rural areas, who do not have ready access to much of the technical know-how needed for developing irrigated agriculture on a small scale]



(7) **Community Water Development** ed. by Charles Kerr, 280 pp, Pub: ITP
[The UN Water Decade has been the catalyst for much research and development in water-related fields, and one result has been improved dissemination of the water technologies being developed. This book presents some of the best material from leading researchers and practitioners in rural water supply in developing countries. Sets out the original concepts & field experiences for the development of appropriate technologies for water supply, and illustrates the changes in thinking which have taken place over the decade]

(8) **Ferrocement Water Tanks & their Construction** by S.B. Watt, 118 pp, Pub:ITP
[Describes how cylindrical water storage tanks of upto 150 cubic metres capacity can be built using wire-reinforced cement-mortar. It covers design and planning, with an indication of costs, standards & recommended methods; roof catchment water supplies; etc]

(9) **Pumps without Water** by Felix Ryan, 50 pp, Rs. 10/- Pub: SSK
[This small booklet has some crystal clear thinking about water, pumps, and water harvesting]



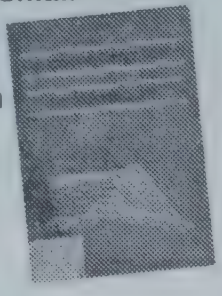
(10) **A Handbook of Gravity-flow Water Systems** by Thomas D. Jordan Jr. 250 pp, Pub: ITP
[Originally written for the construction of gravity-flow drinking water systems for rural communities in Nepal, but most of its principles are applicable everywhere. Material is organised for quick reference, and allows overseers of both engineering & non-engineering backgrounds to understand quickly & easily]

(11) **Water Treatment and Sanitation** by H.T. Mann & D. Williamson, 96 pp, Pub: ITP
[A handbook of simple methods for rural areas in developing countries. This corrected and revised impression includes a new Appendix on planning in developing towns]

(12) **Water, Earth & Man** ed. R. J. Chorley, Pub: Methuen & Co., London]

(13) **Water** by Fred Powledge Hard back, $ 14.95, Pub: Farrar Straus Giroux.
[On the nature, uses and future of our most precious and abused resource]

(14) **Design & Construction of Small Earth Dams** by Kenneth D. Nelson Pub : Inkata Press, Australia [A small classic on the subject]



Arsenic in the Water...Run...Run...Run...

(News-items containing the debate around the findings of non-acceptable levels of arsenic in drinking water)

Slum colony faces slow poisoning

HT Correspondent
CALCUTTA, November 9

MORE THAN 500 families of a slum in the Bansdroni area are being slow-poisoned to death. The foul-smelling, reddish and yellowish water that flows out of three deep tubewells these families depend on contains a very high level of arsenic.

The Jadavpur University's School of Environmental Studies that conducted a sample survey of the Bekarbazar slum along Tolly's Nullah found arsenic contamination of groundwater to be above 250 micrograms a litre. "Nearly all the members of these 510 families have developed pigmentation of their skin, sores and itches. Many have swollen limbs and show other signs of severe arsenic contamination," Dr Dipankar Chakraborty, head of the School, told *The Hindustan Times*, The water samples from the tubewells were taken on Monday and the results of the analyses were out today.

"The situation is alarming. One person died a few months back and a few are seriously ill,"said S M Ghosh, convenor of the Adi Ganga Paribesh Suraksha Samity. The Samity, that is working for rejuvenation of Tolly's Nullah (also known as the Adi Ganga), requested the School to carry out the survey after receiving complaints from local people about the water. Incidentally, the tolerable limit for arsenic in water recommended by the Union Health Ministry is 20 microgram per litre, double that of WHO's prescription of 10 microgram per litre. But the State Government has pegged the upper limit at 50 microgram per litre.

Of the three tubewells whose water was analysed, two were installed by the Calcutta Municipal Corporation and the third by the locals under the banner of the Bekarbazar Cooperative Housing Society. The Society was formed by settlers along the Tolly's Nullah and unemployed people in 1989. "All residents of Bekarbazar (a huge slum stretching along the Nullah from Garia to Kudghat) live in unhygienic conditions. Malaria and gastro-enteritis are common here. And now the arsenic in their bodies will mean certain death," said Society general secretary Subol Chandra Karmakar. "The tubewell water turned yellow and reddish a few years back. People started falling ill and developed skin diseases. But we never knew it was arsenic," he added.

Environmentalists have recommended immediate sealing of the killer tubewells. "But there is no other source of water for the people. They have to depend on the three tubewells for drinking water, bathing, washing clothes and utensils. The CMC should make immediate arrangements for supply of tap water," said Karmakar.

Dr Chakraborty and the Samity have sent the water sample reports to the Mayor and various Government agencies. "But going by previous experience, I'm sure the CMC and the State will dismiss the analyses," said Dr Chakraborty. Which means that the people of Bekarbazar are doomed to an excruciating death. (Hindusthan Times, 10/11/2000)

Arsenic contamination in more city areas

Statesman News Service

CALCUTTA, Nov. 9. - The School of Environmental Studies, Jadavpur University, has once more claimed to have found arsenic contaminated water in sources hitherto known to have been free from the chemical.

This time arsenic has been found in HL Sarkar Road and Baker Bazar Colony in Bansdroni.

Also, new sources have been detected in Prince Anwar Shah Road, Prince Ghulam Mohammed Shah Road, Rajendra Prasad Sarani, Jodhpur Gardens, Kalabagan Lane, Naskar para (in Raynagar), Aurobindonagar (in Naktala) and NSC Bose Road, claimed Dr Dipankar Chakraborti, director, SES.

"The Bansdroni Bekar Bazar tubewell is used by about a thousand people every day. The arsenic content is rather high in this area. Naturally , it is dangerous," Dr Chakraborti said.

Earlier, Prince Anwar Shah Road and Lake Gardens were found to be arsenic affected areas by the SES in 1996. The CMC has already sealed a number of tube wells in these areas, he said.

The Statesman has been carrying a series of stories on arsenic contamination in different parts of the city. Alipore has been added to the list of arsenic-hit areas by the SES.

Dr Chakaborti said that arsenic contamination is spreading in the city. If the government does not take immediate steps, very soon the entire city would be polluted.

He said that CMC authorities did not believe him when he declared in 1993 that Jadavpur was contaminated with arsenic. "An employee of the university was treated at the arsenic clinic in SSKM hospital. He has most of the arsenical skin symptoms. The fact that he stays close by, in Narkelbagan, is proof enough", he said.

The mayor yesterday told **The Statesman** that the CMC conducts tests throughout its own areas on a regular basis.

In that case, new areas with arsenic contaminated water should not have emerged at all.

The SES has not yet concluded whether reports this time indicate a higher level of contamination than those found earlier in these areas. It is, however, clear that more and more areas would be found with arsenic content, said Dr Chakraborti.

Of the 101 tubewells where tests were conducted by the SES, 99 are CMC tube wells which go more than 300 ft into the ground.

The SES has traced 13 CMC tube wells where arsenic was found above 5 micrograms per litre;

10 tubewells where it is above 10 micrograms per litre and 4 tubewells where it is above 50 micrograms per litre.

The tubewell in front of 5/43, Prince GM Shah Road, has a contamination of 232 micrograms per litre, the one in front of 5/27 Rajendra Prasad Sarani has a concentration of 309 micrograms per litre and Bansdroni Baker Bazar has 228 micrograms per litre of arsenic.

At Mecon Towers, a housing complex with 96 flats on Prince Anwar Shah Road, level of arsenic in water tapped from a tubewell was 27 micrograms per litre in the direct pump and 16 micrograms per litre in the reservoir.

Another source, the Bansdroni WBSEB office, has 165 micrograms per litre of arsenic.

Dr Chakraborti also conducted tests in about 26 private tube wells in the area. He said the arsenic level ranged between 7 micrograms per litre to 346 micrograms per litre. He added that owing to high nutrition status, the contaminated water might not have had adverse impact on people using water in any of these sources.

But in rural areas, people with low nutrition status, have been found to have developed cancer when they were exposed to high level of contamination in the range of 232 micrograms per litre.

(The Statesman, 10.11.2000)

Water tests confirm Alipore's arsenic fears

SWATI SENGUPTA

Statesman News Service

CALCUTTA, Dec. 4. - Tests conducted by the All India Institute of Hygiene and Public Health have confirmed that the water in Alipore does contain arsenic beyond the levels recommended by

the World Health Organisation.

The Statesman broke the story on 26 October that the School of Environmental Studies, Jadavpur University, had found arsenic above acceptable limits in Alipore's water samples. What followed the report was a drama of sorts.

Mr KK Choudhury, a Central Public Works Department executive engineer, took the trouble of collecting water samples from the Alipore area and sending them to the AIIHPH.

The engineer even wrote to **The Statesman**, appending the report of the tests conducted by AIIHPH, claiming that the report indicated that the arsenic content of Alipore water was absolutely within permissible limits.

The Statesman checked with the AIIHPH director, Prof K J Nath on Saturday and found that the engineer needed to be better informed.

The AIIHPH director told **The Statesman** that the tests reflected that arsenic was well above WHO recommended limits in Alipore.

The engineer was under the impression that 100 micrograms per litre was the WHO guideline on arsenic acceptability, while it is 10 micrograms per litre. In India, the maximum permissible limit is 90 micrograms per litre.

Mr Choudhury too admitted: "I was under the impression that the WHO guideline value is 100 micrograms per litre."

The Calcutta Municipal Corporation had instructed offices using water with high arsenic content to stop using water from these sources. The SoES, Jadavpur University, had found arsenic contaminated water in these areas.

But CMC authorities maintained that their own tests showed that the Alipore water had nothing that could "cause panic".

Tests conducted by the AIIHPH reveal high arsenic content in many of the samples, including those from 1 Belvedere Estate, Regional Meterological Centre and the National Library.

Mr Choudhury had written to **The Statesman** on 1 December, saying: "the test report (AIIHPH report) indicates that samples relating to the Belvedere Estate and National Library do not contain arsenic beyond the acceptable limit prescribed by the World Health Organisation".

He added: "...would also like to intimate you that water supplied to these colonies are quite safe for drinking".

When **The Statesman** contacted him on Saturday night, Mr Choudhury said:."discontinuing water supply to the contaminated sources at Alipore, where CPWD supplies water, and to provide immediate alternative sources is impossible, since the process is expensive.

Alternative sources of water supply can be seen as a remedy achievable only in the long run."

The AIIHPH findings are :

- 1, Belvedere Estate, tube well no. 1 - 67 micrograms/litre
- New tube well at 1, Belvedere Estate - 47 micrograms/litre
- 30 Belvedere Estate, new tube well - 27 micrograms/litre
- National Library, t.w. no. 1 - 20 micrograms/litre
- National Library, t.w. no.2 - 20 micrograms/litre
- Regional Met Centre, t.w. no.1 - 120 micrograms/litre
- National Test House, t.w. no. 1 - 33 micrograms/litre

(The Statesman, 05.11.2000)

Better Proof Needed on Arsenic Problem

SIR, - I ignored your initial stories appearing in the issues of 26 and 27 October as just possible scare mongering of some greenhorns. But your edit piece (30 October) really takes the cake. It is garnished with purported 'opinions' of big names like WHO, US National Research Council, University of California, Berkeley etc. and nearer home, the SoES of Jadavpur.

I take strong exceptions to most of your points but I would limit myself only to raising some very fundamental questions which beg to be answered by capable and discerning readers.

WHO set a safe limit of 0.01mg/lit and a tolerable limit of 0.05mg/lit of arsenic in drinking water since 1978. Prior to that the limits used to be 5 to 10 times higher. What are the actual medical and morbidity statistics for these arbitrary shifting of bases? Could someone from medical fraternity throw light with adequate reference material? Interestingly enough, the internationally famous table water of Vichy (France) mineral springs contains 0.54mg/lit arsenic.

Similarly the question of cancer risk as propounded by US National Research Council is without any solid scientific basis. Sir Charles Bodmer and his team of Imperial Cancer Research Fund of London have authored numerous papers on statistical probabilities of cancer over the last several decades.

Yet no clear answer on various risk factors have been found. The so-called findings of the University of Berkeley in the course of short visits to Bangladesh fall in the same category of speculation.

Your observation that the source of arsenic is in 'geological deposits underground' has not yet been proved or established. I would politely ask to be given solid proof in this respect. As a geoscientific tenet this is improbable. So your epidemiological conclusions are wishful thinking at this point of time.

Also your reports and editorial imply that 'arsenic contamination is spreading', a point attributed to Dr Chakraborty of SoES. This is preposterous. Arsenic happens to be an inorganic chemical element located somewhere in the Periodic Table of Mendelieff. It can never behave like Cholera vibrio or other organic bacteria in propagation and transmission through water.

Finally, what is the basis of your conclusion to the effect that the 'mix of short term and long term measures needed to combat the menace has by now been identified'? Has anyone identified the cause, the contour or the dimensions of the problem? Minister Gautam Deb has used a quaint term 'geoganic'; SoES has long since propounded a geological origin of arsenic of ground water.

In fact, unfortunately so far, no one has done any serious, systematic scientific investigations in this regard, though I have been crying hoarse for 15 years. With diligent scientific efforts this problem could have been tackled much earlier. Taking a dig at the State government or the Central government is misplaced because the parameters of investigations can be dealt with at specific levels of geoscientific expertise. It is beyond the ken of half-baked engineers, pseudoscientists or politicians.

Yes, it is time to act on these aspects, but definitely not on unplanned, unwarranted and wasteful remedial actions hurriedly. That will be like putting the cart before the horse. In a poor country like ours we neither deserve nor can afford such follies. - Yours, etc.,

SK GUHA. Calcutta, 30 October.

How Toxic Is Toxic

Sir, - Apropos the news item "Alipore water has arsenic above acceptable limit" (26-27 October). The limit of arsenic in drinking water - 50 microgram per litre - that has been considered as the "Maximum Permissible Limit" by WHO and also as the "desirable limit" in Indian standards of drinking water, is not based on findings of any risk assessment methodology. The level was first developed in 1942 by the US Public Health Service and adopted therefrom by the US Environmental Protection Agency as the Maximum Contaminant Level in their drinking water standard.

Toxicity of arsenic depends on a number of factors - chemical and physical forms of arsenic compounds, dose and duration of exposure, routes of entry in the body, dietary level of interacting elements, age and sex of exposed individuals etc. Promulgation of lower arsenic level would result in a considerable uncertainty on the performance and effectiveness of the existing arsenic control technology.

Moreover, we should be mindful that arsenic removal technology does not adversely impact the treatment of other water quality parametres. What we need is rational approach based on epidemiological studies to fix safety limit of arsenic in drinking water.

Yours, etc., JAYDEV JANA. Calcutta, 27 October.

— We do not subscribe to the view that epidemiologists and environmental experts from the World Health Organisation, the School of Environmental Studies, Jadavpur, or the University of California, Berkeley, all belong to the category of "pseudoscientists". Our reports and editorial were based on their findings.

Although there may be room for scientific debate on the exact causes for the presence of arsenic in groundwater, we do not accept that remedial measures have to await the establishment of this cause. That arsenic poisoning in West Bengal is widespread is not disputed by anyone.

Some of the factors mentioned as affecting arsenic risk are mere academic quibbling.People of all ages and sexes drink water from the public supply, and route of entry is through the mouth. - Ed.S.

(The Statesman 7.11.2000)

Arsenic Threat

Sir, - Writers of two letters on arsenic (7-8 November) want scientifically established proof of the mischief that it can cause to human bodies. Such a thinking is out of harmony with the present day concern of environmentalists.

Principle 6 adopted in the UN conference on Human Environment (1972) hoped that science would be able to provide policy-makers with proof of harm that any pollutant might cause.

All searches were for determining the assimilative capacity of human beings and nature. Such a stand only created uncertainty.

Then came a shift in thinking to the precautionary principle mentioned in the World Charter on Nature (UN, 1982), and restated in the 15th principle of the declaration of the UN Conference on Environment and Development (1992) thus: "In order to protect the environment, the precautionary approach shall be widely applied by states according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measure to prevent environmental degradation."

The precautionary principle has been endorsed in the Vellore case by the Supreme Court (1996) in no uncertain terms: "Precautionary Principle and Polluters Pay Principle are part of the environmental law of this country." The apex court affirmed it in a vegetable oil industry case of Andhra Pradesh (1999).

We are grateful to the School of Environmental Studies, Jadavpur University, whose pioneering work has sufficiently established the presence of harmful arsenic in groundwater in different places, and the serious and irreversible damage it has caused to human beings. No better proof is necessary to label arsenic as a threat to human beings.

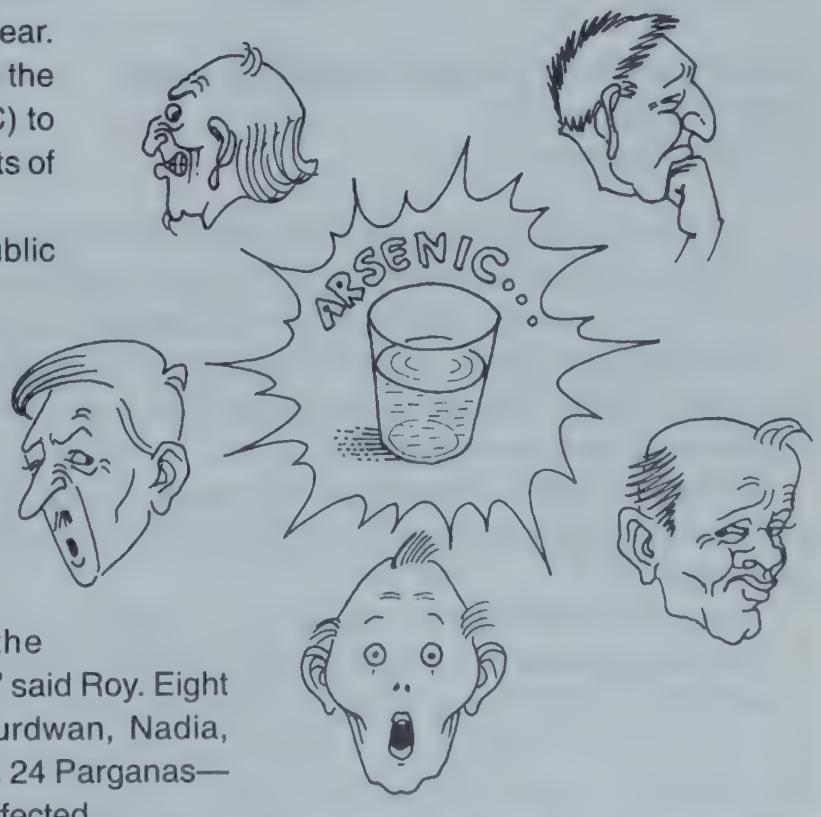
Yours, etc., SIVABRATA CHATERJEE. Calcutta, 7 November.

(The Statesman 14/11/2000)

City on arsenic-watch list

JAIDEEP MAZUMDAR
CALCUTTA, November 28

This Metropolis may get the 'arsenic-affected' tag by early January next year. The State Government has instructed the Calcutta Municipal Corporation (CMC) to test groundwater samples from all parts of the city for arsenic contamination.



Chief engineer of the State Public Health Engineering department Asesh Roy told **The Hindustan Times** that the CMC has been asked to complete the tests by mid-December and submit the findings to his department.

"If the results so warrant, we may declare Calcutta arsenic-affected by early January after completing the necessary formalities and with the permission of the State Government," said Roy. Eight districts— Malda, Murshidabad, Burdwan, Nadia, Hoogly, Howrah and North and South 24 Parganas— have already been declared arsenic-affected.

Roy said he had assured the CMC of the State Government's help in testing the water samples. "I've been told that the CMC has already started collecting the water samples and many have been delivered to various laboratories." He said that if an adequate number of water

samples (collected from tube wells) are found to contain arsenic above the permissible limit of 0.05 milligram per litre, the city will become the ninth district to be declared arsenic-affected.

Expert bodies such as the All India Institute of Hygiene & Public Health (AIIH & PH) and the Jadavpur University's School of Environmental Studies (SoES) have already declared Calcutta as arsenic-affected. "Calcutta is arsenic-affected and an official declaration does not matter. But it's good that the State Government has woken up to the problem that has been staring at its face for so long," said SoES Director Prof Dipankar Chakraborty.

"Calcutta is buffeted by South and North 24-Parganas on its south and east, Nadia to its north and Howrah to its west. All these districts are arsenic-affected. So how come Calcutta is left out?

"Hydro-geologically, Calcutta is in a very high-risk zone. And arsenic has been found in groundwater sources in Jadavpur, Lake Gardens, Jodhpur Park, Alipore, New Alipore and Bansdroni during tests carried out by us as well as other agencies," said AIIH & PH Director-Professor, K.J.Nath.

Dr P.H.Ananthanarayanan, director of the same institute, said it would be wrong to assume that Calcutta is not affected since its residents do not show symptoms of arsenic contamination like pigmentation, skin lesions and sores.

"Most Calcuttans drink tap water and their diet is also better than people of the rural areas. So they may not show signs of arsenic poisoning. But the groundwater here is definitely contaminated," he said. (Hindustan Times 29/11/2000)

Two out of every ten persons in the State are being slow-poisoned to death, says a survey on arsenic contamination

There's poison in your drinking water

JAIDEEP MAZUMDAR
CALCUTTA, November 22

The Foul-Smelling, reddish water flowing out of tubewells is ready to kill. Nearly two out of every ten persons in the State are being slow-poisoned to death and more than a third of the State's population would be carrying heavy doses of arsenic in their bodies in five years' time.

Citing the situation as 'alarming' Prof Dipankar Chakraborti, director, School of Environmental Studies (SoES), Jadavpur University, said the latest survey shows that arsenic contamination of groundwater is on the increase.

Groundwater in 1,287 villages in 70 block of nine of the 18 districts of the State contains arsenic much above the permissible limit of 50 micrograms per litre, affecting a 17.3-million population.

"One of the findings of our survey is far more alarming. In a test case involving five families whose members were suffering from arsenic poisoning, we supplied them safe and purified drinking water every day for five years. We monitored their arsenical skin lesions and tested their urine, hair and nail samples regularly for signs of recovery. But we found that the arsenic levels in their urine, hair or nails was not decreasing," said Dr Bhajan Das, a senior researcher.

The reason, the researchers say, is that the five families "could not avoid arsenic intake from other sources like vegetables and food-grains grown in land irrigated by the contaminated groundwater". The finding has set the alarm bells clanging. "We had been recommending that purified or

surface water be supplied to people living in arsenic-contaminated areas for their drinking and cooking purposes. But this alone would not help. Dependence of groundwater for washing clothes and utensils, bathing and even for irrigating croplands has to stop. But that is not possible. So what is to be done?" wondered Chakraborti.

As per our estimates in light of this finding, if low-cost solutions to purify groundwater at the individual tubewell level are not found immediately, more than 22 million people of the State would be affected by arsenic poisoning by 2005," said another senior researcher. "Moreover, we suspect that with the exploitation of groundwater increasing in the remaining nine districts, it is only a matter of time before they're added to the 'affected' list. And there's another aspect-people of other districts who consume vegetables or foodgrains grown in those areas of the nine affected districts will also be affected slowly," he added.

After analysing 90,000 water samples and thousands of hair, nail, skin scale, blood and breast milk samples from people, as well as cow milk, cow urine and cow hair samples from the nine districts, theSoES has found that 55 per cent of the tubewells were unsafe and 83 per cent of the people have arsenic above normal levels in their hair, nails, skin scales or blood.

SoES Survey

District	Total Blocks	Blocks Surveyed	Affected Blocks
North 24-Parganas	22	22	19
South 24-Parganas	17	11	10
Nadia	17	15	15
Malda	14	05	05
Murshidabad	26	18	I7
Burdwan	31	02	01
Hooghly	17	03	01
Howrah	14	01	01

Source :Hindusthan Times, 23.11.2000

Information on Arsenic Food

People in West Bengal are highly susceptible to arsenic poisoning because of their food habits, states a report of the United Nations Industrial Development Organisation (UNIDO). According to it, the chemical gets concentrated in the roots of vegetables that form a big part of Bengalis' diet. "Liquid pulses and potato curry were found to retain most of the arsenic even after cooking. Tea and milk were also found to have arsenic even after boiling", the report mentions. Using contaminated groundwater for irrigation has added to the problem, as it increases the arsenic levels of the soil and consequently of the plants. Dipankar Chakraborty, director of the School of Environmental Studies, Jadavpur University, Kolkata, agrees with the finding of the UNIDO study but says that it is unable to give a complete picture of the problem. Meanwhile, an all-party delegation recently met Venkaiah Naidu, the Union minister for rural development, and urged him to sanction funds for combating the arsenic menace.

(Source : Down to Earth, 30th September'2001)

The Living Soil

> We can no more manufacture soil with a tank of chemicals than we can invent a rain forest or produce a single bird. We may enhance the soil by helping its processes along, but we can never recreate what we destroy. The soil is a resource for which there is no substitute. Like the earth itself, it is a network of activity that we cannot yet understand let alone replicate.
>
> —Donald Worster

One of the first, often subconscious, acquaintance a person has with nature, is with the soil. But there are only a few who can state what soil is. The definition usually accepted is limited to an idea of the surface of the Earth, the object of farming.

A soil is made up initially of rock that has been substantially transformed by the vegetation and various micro and macro-organisms.

Soil structure: Determines how much air and water permeability a soil has, and its water capacity; in other words, the properties which mainly determine its fertility. The most important biological factors in the formation of a soil structure are the roots of plants, mushrooms, bacteria, and soil animals. All influence the soil structure, both directly and indirectly.

The roots of grassy plants, especially the cultivated crops such as lucerne and clover, favour the formation of grains and fine-cloddy structures.

The direct structure-forming effect of living organisms is augmented by their constant excretion of enzymes and organic compounds which can bind the soil particles and aggregates. Dead animals or plants have a similar effect upon soil structure formation by supplying the soil with organic compounds.

Water permeability is the capacity of a soil to allow, water through. Water permeability is measured by the quantity of water that can seep through the soil within a certain interval of time given a constant of head water.

The water permeability value is important for determining how to control the water-caused erosion of the soil. **The lower the water permeability, the more quickly it is eroded.** Given a vulnerable soil, it is necessary to take measures to decrease the surface runoff and increase the quantity of water the soil accumulates inside the ground. **Humus** are dark colloidal substances impregnating the mineral part of soil and imparting to its upper horizons a darker colour, including even a black shade, which gradually weakens with depth.

The process of humus formation is a complex biochemical transformation of organic remains entering into or onto the soil. These undergo transformations affected by soil microorganisms.

Under natural conditions, the reserves of humus are relatively constant, though in certain cases they can increase (in steppes, savannas, and when herbaceous vegetation is replaced by forests). **When soils are agriculturally managed, humus is usually lost if it is not replenished by cycling of organic matter.**

Humus is an indirect but a very important and indispensable element of soil fertility. Humus accumulates all of the basic nutrients necessary for plants and micro-organisms and retains them for a long time. As a matter of fact, humus not only accumulates these nutrients but also prevents them from their rapid leaching into deep horizons or from their transformation into gases and, as such, their escape to the atmosphere (CO_2, NH_3, etc). Finally, humus contains some growth stimulants for plants.

In view of this, when developing soils for agriculture, it is of primary importance to be able to augment and regulate not only the content of humus but its quality as well. The expansion of farming and mechanized tillage of soils brought about certain new problems for tropical agriculture. The first problem is the increasing mineralization of the organic remains of humus. For example, according to Denisov (1971), in Senegal, after two years of savanna soil tillage, the arable layer of the soils was found to be greatly silted, about 30% of organic matter, or up to 60% humus and 10% nitrogen were lost, all this resulting in essential decreases in crop yields.

When replenishing the reserves of humus in tropical soils, the specific conditions and the rate of decay of organic debris must always be taken into account. It is sometimes feasible to enrich tropical soils with various composts. It is also very effective to plough the green mass as a form of fertilizer. It was found out that in Africa, the following species were beneficial for this purpose: bristle grass (Setaria splendida), which can accumulate

in its green mass up to 831 kg/ha nitrogen and 861 kg/ha potassium; elephant grass (Pennisetum purpurum), yielding up to 775 kg/ha nitrogen, as much as 970 kg/ha potassium, 186 kg/ha calcium, 108 kg/ha magnesium, when the conditions are sufficiently humid (Denisov, 1971).

The main organic fertilizers applied in the tropics are **green manure crops** and all kinds of composts prepared from the leaves of woody species and from other organic remains. Annual legumes are used for green manuring (sideration); they accumulate nitrogen. Less frequently, cereal grasses or plants of other families are used for this purpose. Organic fertilizers will always be important in improving the fertility of tropical soils, especially under irrigation, when the predecessor of the basic crop may always be a green manure crop.

Living organisms (bacteria, fungi, plants, animals) reproduce organic mass and secrete various organic compounds. The dead parts of living organisms and their excrements enter the surface layer of the earth. They serve not only as the source of energy for soil formation, but also as vital material for the synthesis of new specific soil organic and organo-mineral compounds. The latter owe their formation to the activity of macro-and micro-organisms inhabiting soils. These organisms take part in the formation of and determine the nature of the most specific part of soil, namely humus substances or humus compounds.

Living organisms (especially plants, products of their vital activity, and humus compounds derived from their dead parts) play the leading role in soil formation.

Most soil and terrestrial animals feed on organic matter (both dead and alive). Processing it, they infect the organic remains with microorganisms. Animals grind the organic mass, improving the conditions for its further transformation into humus substances, which is effected by microorganisms.

Various species of animals (worms, burrowers, etc) and especially arthropods (ants and termites), act as sanitars of tropical forests. They eliminate dead wood, process annual litter-fall and in this way, create better conditions for the vital activity of plants and microorganisms.

In addition to decomposing organic remains, animals structure soil (for example, after it passes through the digestive tract of worms, termites).

The animal population of soils also acts as a powerful agent in the redistribution of organic and humus substances. Finally, animals take an active part in metabolism between soil and plants. Upon their death, they leave in soil some quantities of soil substances which get later on involved in the biological cycle.

As a result of the deforestation and elimination of natural vegetation, as well as of soil tillage without special prophylaxis providing for the conservation of soils, the latter, as a rule, lose their capacity to retain water and mineral substances. They begin to accumulate skeleton particles causing the migration of soil particles, which leads to irreversible losses of good soils. Slow or rapid degradation of soils is one of the most important reasons for the disbalance between the natural biogeocoenoses, especially in areas where the climatic and soil conditions promote such changes. It is frequent practice that, striving to raise high yields, people ignore the needs of soils, pay no attention to their fertility, its restoration and improvement. Any crop-yield harvest is part of soil fertility which is irreversibly alienated from soils. The volume of harvests depends on the "restoration" of soil fertility and on its additional improvement by careful and rational use of soils. Reduced yields indicate that soil fertility diminishes as a result of various forms and degrees of soil degradation.

Therefore, the problem of preventing various forms and degrees of degradation of tropical soils is the most serious one. It must always be considered when projects for rational use and development of soil resources in the tropical and subtropical areas are compiled.

Deforestation intensifies the runoff rivers, and the increased runoff carries away larger quantities of nutrients from soils.

The degree of the increase in the runoff and in its damage to soils is found to be drastically greater in ploughed lands than in meadows, and on steeper slopes than on more gentle ones.

Overgrazing:

Cattle husbandry may cause serious soil degradation. Depending on the properties of the soils under grazing, the climate and the composition of local vegetation, an area can feed only a limited number of animals, because the equilibrium between

the rate of vegetation consumption by grazing cattle and that of vegetation reproduction (restoration) must never be disturbed. This rule determines the productivity of any territory used for cattle grazing. As soon as the permissible threshold is violated, the vegetation in the given territory begins to fade, while the soil, having lost its protective vegetation cover, starts degrading.

Consumption of plants and heavy grazing on soils are the important reasons behind the degradation of pasture lands. These two factors combined are responsible for the decrease in the phytomass and in the acreage under vegetation.

From 1900 to 1940 in India, the live-stock capita increased from 84 million to 147 million, while the acreage of pastures was reduced by 49 million acres.

Overgrazing also provokes the erosion of pastures. It is not only footpath erosion that destroys soils, but they are also compacted, and their stratum of active moisture cycle thins because the water-permeability in the compacted horizons is lower.

The **natural vegetation** of tropical and subtropical soils, particularly woody vegetation, produces the largest quantities of organic matter because tropical and subtropical plants draw the nutrient elements they need not only from the soil, but also from the atmosphere. This feature, is characteristic only of natural plant species. The rhythms of plant growth and development, the rates of the constant exchange of matter and energy (metabolism) between plants and soils - this is all mainly achieved through the falling parts of plants.

As a rule, after the natural vegetation on such soils is eliminated, they prove to be of high productivity only within the first two or three years, and afterwards their yields diminish drastically.

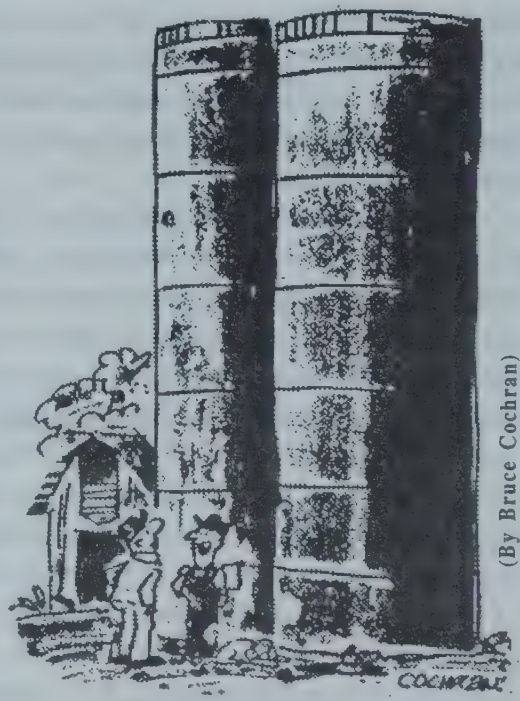
The main reason for this phenomenon is the violation of the natural cycle of the plant nutrients and moisture. Tropical soils sown with tropical crops undergo a onesided process: the nutrients they contain are drawn out and the moisture from their surface is used nonproductively, especially after harvesting, or on fields under ploughed crops. There is almost no natural return of nutrients through the dying parts of plants. The very tillage of soils intensifies the mineralization of organic remains and of humus substances. Soils also lose other nutrients because of erosion.

The present-day activity of man in the tropics has radically changed the nature of the land which used to exist there in the past. Some regions in this belt have been badly damaged due to their predatory and uncontrolled usage. Imprudence, on the one hand, and unrestrained ravenousness and greediness, on the other, have brought about the most intensive degradation of tropical soils.

— Dr. S.V. Zonn

Sergei Vladimirovich Zonn is a Doctor of Agricultural Sciences and Professor at the U.S.S.R. Academy of Sciences. For over 25 years, he has been researching and teaching courses on tropical soil science. And for 20 years, he has been chief editor of the periodical 'Soil Science'. Till 1985, he was vice-president of the World Society of Soil Scientists. He is also a member of the International Society of Soil Scientists. The above article consists of extracts from his book 'Tropical and Subtropical Soil Science', 422 pages, published by Mir Publishers, Moscow, 1986.

"Health is a whole. There is no separate human health, no separate animal, no separate vegetable, no separate soil health. And the way in which this whole can be got and maintained is that every living thing in it after its death should not be treated as waste, but be returned to the soil".



(By Bruce Cochran)

"They're not full of grain. They're full of topsoil. I'm gonna sell it for $ 1000 a bushel when nobody has any!"

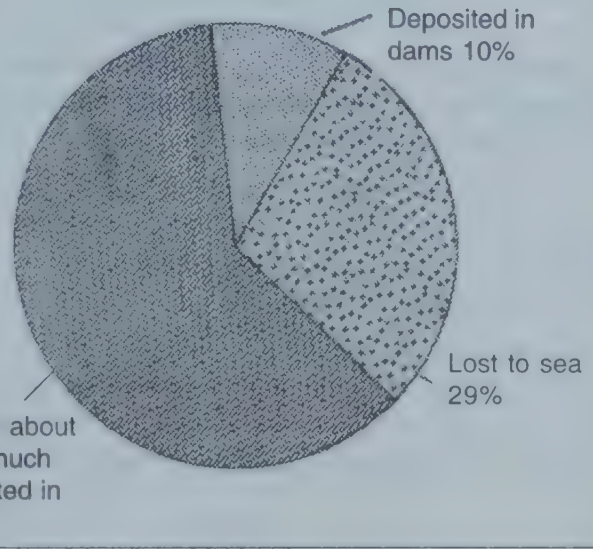
Forests play an important role in controlling flood by controlling soil erosion. Once forest lands are denuded, soil loss can increase by as much as 400 times. Overgrazing also increases soil loss very substantially. This soil gets deposited in river beds raising their height and reducing the quantity of water the river channels can hold. The less the water the river holds, the more the flood.

India faces a massive soil erosion problem. Some 16.35 tonnes of soil is lost every year from every hectare of India's land. Overall, this adds up to 5334 million tonnes of soil eroded every year. This quantity of soil could be used to make brick houses for every family in the country from Kashmir to Kerala.

Of the 5334 million tonnes of soil eroded every year:

- 29 per cent goes to the sea;
- 10 per cent gets deposited in dams reducing their storage capacity by 1-2 per cent every year; and,
- 61 per cent gets transported from one place to another, quite a bit of it setting on river beds.

INDIA'S ANNUAL SOIL LOSS - 5,334 MILLION TONNES



Only by faithfully returning to the soil, in due course, everything that has come from it, can agriculture be sustainable and the earth be made to yield a genuine increase. The only way to prevent erosion is to preserve soil structure. The only way to preserve soil structure is to add humus, a product of decomposition of animal and vegetable matter, brought about through the agency of micro-organisms.

— Banwarilal Choudhury

The only places where soils are conserved or increased are

- In uncut forest
- Under the quiet water of lakes and ponds
- In prairies and meadows of permanent plants, and,
- Where we grow plants with mulched or non-tillage systems.

These then are the core subjects of sustainable societies of any conceivable future. They are not, you might notice, the subjects most taught in the agricultural colleges or forestry courses of the recent past.

The Living Soil

(also refer : 'Ecological Agriculture')

1. *Managing some Tropical Soils* - Rural Research No. 117 by Wayne Ralph
2. *Biology of Earthworms* by C.A. Edwards & J.R.Lofty £ 9.95, Pub : Soil Association
3. *Life to the Land* by Katherine Castelliz £3.30, Pub: Soil Association
4. *The Living Soil & The Haughley Experiment* by E.B.Balfour, £4.00, Pub: Soil Association

Wrong idea

- The idea that plants absorb nitrogen from inorganic nitrogen salts is wrong, say Steven Perakis and Lars Hedin from Cornell University, New York. Plants absorb nitrogen only from organic compounds, they report in *Nature*. The findings may change the entire concept of nitrogen cycle, vehicular pollution and the effect of inorganic fertilisers.

The Telegraph
25th Feb 2002

'Green Revolution' - MENACE!

"Green Revolution': a package of H.Y.V. seeds, chemical fertilizers and pesticides, requiring high irrigation and mechanized operations; it is usually adopted for mono-culture cropping which are often cash-crops for export. The 'Green revolution' was once touted as the answer to the food needs of Third World Countries, but today...

COSTS

1) reduces the natural fertility of the soil
2) harms the soil structure and soil acration
3) reduces the water-holding capacity of the soil
4) more prone to soil erosion by water and wind

5) diminishing returns on inputs (the ratio of energy input to output halves every 10 years)
6) causes 'soil addiction'
7) indiscriminately kills useful insects, micro-organisms and also predator species that check excess crop damage by insects

8) breeds more virulent and resistant species of insects
9) reduces genetic diversity of plant species
10) increases susceptibility to plagues
11) toxic chemicals pollute the land and water
12) agro-chemical factories also pollute the air

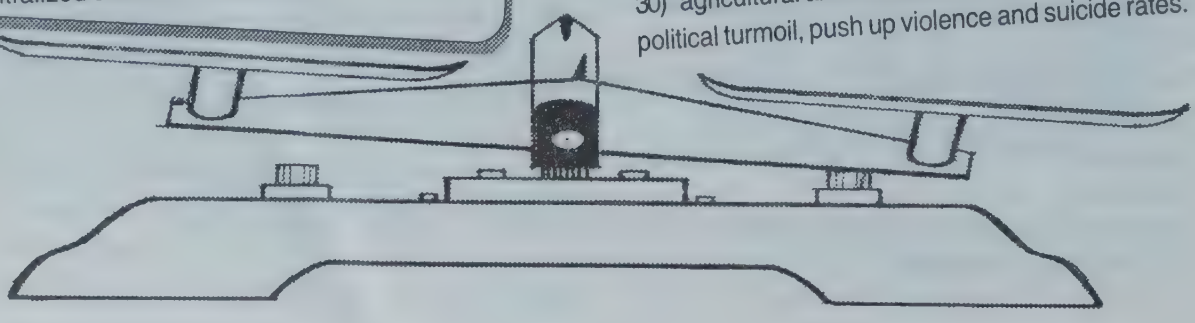
13) endangers the health of both the farmers and the workers in agro-chemical factories
14) poisons the food with highly toxic pesticides
15) cash crops displace nutritious food crops
16) chemicals kill the natural taste of food
17) high inputs increase agricultural expenses

18) heightens the farmer's work burden and tension
19) depletes fossil fuel resources
20) increases the irrigation needs of the land
21) big irrigation schemes often lead to their own spiral of problems
22) depletes ground water reserves

23) lowers the drought tolerance of crops
24) causes the appearance of 'difficult' weeds
25) heightens socio-economic disparities and land holding concentration
26) high input subsidies lead to inflationary spirals
27) increases political and bureaucratic corruption
28) destroys local culture (commercialization and consumerization displacing self-reliance)
29) throws financial institutions in disarray (as impoverished farmers demand write-off of loans)
30) agricultural and economic problems spark off social & political turmoil, push up violence and suicide rates.

BENEFITS

1) short-term increase in production
2) more sales for agri-business
3) power to bureaucrats and technocrats (centralized control of resources)



• The 'Green Revolution' has been a flagrant example of a 'development'solution that has brought nothing but misery to the poor. Yet we continue to try to tell the other half how to live.

— Susan George
(From "How the Other Half Dies')

• ... The field director of the Rockefeller Foundation in Mexico became head of a new office within the Mexican Ministry of Agriculture. ....Policy choices systematically discarded research alternatives oriented toward the non-irrigated subsistence sector of Mexican agriculture. Instead all effort went to the development of a capital-intensive technology applicable only to the relatively best-endowed areas or those that could be serviced by massive irrigation projects.... Agricultural modernization came to substitute for rural development.

... Rapid urban-centred industrialisation, so profitable for a few, simply could not coexist with the type of rural development promoted by the previous Cardenas administration. First, true rural development based on making each rural family productive and better off would have meant that the rural majority itself would have eaten much of the increment in food production. This increment was exactly what the ascendant urban interests counted on taking out of the countryside to feed an industrial workforce. Second, genuine improvement in rural life would have sharply diminished the steady exodus to towns and cities. But it was just this ongoing influx of rural refugees that was so 'needed' to perpetuate low industrial wages.

(From 'Food First' by Frances Moore Lappe, Joseph Collins)

CASH CROPS TO CRISIS

Frances Moore Lappe points out in '*Diet for a Small Planet*', that for three hundred years, Western colonial powers established plantation systems in their colonies to produce profitable cash crops for export in place of food for local inhabitants. The crops they selected - tobacco, rubber, tea, coffee, cocoa, cotton and other fibers - have negligible or no nutritional value. These cash crops became established in world trade as the leading exports of the Third World, so that even after national independence their economies remained hooked on such export rather than developing alternative strategies for self-sufficiency.

According to the U.N. Food and Agricultural Organization, some 250,000 square miles of arable land implanted to nonnutritional crops and this acreage is growing faster than that for edible crops. These poor countries are also hooked onto the roller coaster of world trade, and the velocity and amplitude of its cycles can cause as many grotesque distortions in the priorities of weak countries, as it can be advantageous to powerful rich countries and multinational corporations. For example, the Peruvians export fish protein to feed U.S. beef cattle.

We must also question the concept of "productivity", another value-laden term, which economists seek to "maximize" by raising the level of capital invested in each working person or the machines they use. Raising agricultural "productivity", for example, by mechanization and application of fertilizers and pesticides can often produce social costs, such as the income inequities engendered by the "green revolution", and environmental costs in breeding insecticide-resistant pests, runoffs of fertilizer-polluted water, destroying fire stable and resilient forms of agriculture and rapid soil depletion.

-Hazel Henderson
(from 'Creating Alternative Futures')

The Technological Fix

PL 480, The Green Revolution and the Bhopal Tragedy

— In 1954, the US Congress passes Public Law 480, also called the 'Food for Peace Law', with the stated purpose: 'to increase the consumption of US agricultural commodities in foreign countries, to improve the foreign relations of the US and for other purposes'. One specifically declared goal was "to develop and expand export markets for American products".

— India receives PL 480 grain, partly as food aid donation, and partly as purchase against Indian currency. (By 1966, all supplies are sold against foreign currencies convertible to dollars.)

— In 1966, 'Self-help measures' are incorporated in PL 480 supply arrangements, calling for "creation of a favourable environment for potential enterprise and investment, development of the agricultural, chemical, farm machinery and equipment, transportation and other necessary industries using available technical knowhow (from the USA)"

— The 1967, the PL 480 Report notes with pride that in India, fertiliser consumption has tripled in 2 years. It further states that strong emphasis has been placed on improving conditions for foreign private agribusiness investment."

In these years, a massive promotional programme for the Green Revolution is undertaken by US foundations, universities, corporations and the US government in collaboration with their Indian counterparts.

— Supply of hybrid seeds, chemical fertilizers and promotion of large irrigation programmes.

— Crop failures in the first one or two years of 'Green Revolution' because of insect plagues attacking hybrid monocultures.

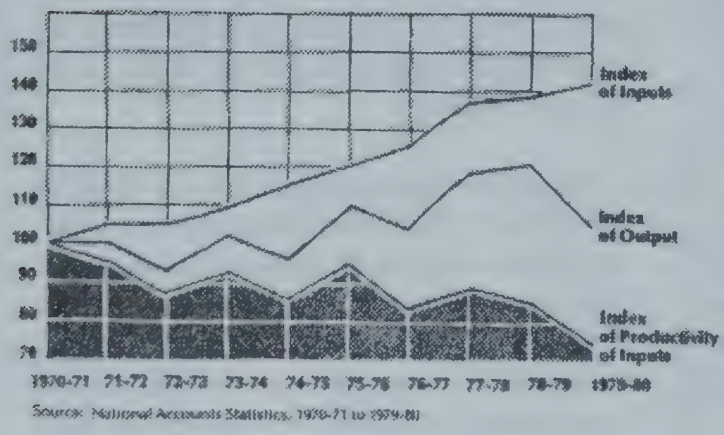
— US supplies pesticides.

— Then concentrate for preparing pesticides in India.

— Then knowhow for full manufacture of the pesticide in India by Union Carbide.

— 1984 : The Bhopal Tragedy happens - the worst industrial accident in the world till date.

Decline in Indian Agricultural Productivity



Source: National Accounts Statistics, 1970-71 to 1979-80

Dryland agriculture has been neglected over the years. And the Green Revolution has further increased the gap between the irrigated and the non-irrigated dry areas. Around two-thirds of India's farmers are engaged in dry farming and only around one-third in irrigated farming. But more than two-thirds of India's agricultural development expenditure is devoted to irrigation and irrigation-based farming.

The result of this heavy and continued concentration of efforts in irrigated areas and simultaneous neglect of dryland agriculture is leading to a decline in overall agricultural productivity.

High Yield, High Risk

• Modern plant breeding, with its emphasis on inbred, uniform strains, has fostered a widespread trend towards large-scale monocultures. Whereas the traditional farmed landscape was genetically diverse, the emerging agricultural landscape is much more uniform. Most inbred strains of crop plant offer short-lived resistance to pathogens and pests. As a result, plant diseases and pest infestations can sweep through monocultures like prairie fire.

• ...During the 'fifties, an additional tonne of fertilizer produced 11.5 tonnes of grains; by the 'sixties, the figure had dropped to 8.5, and in the 'seventies to just 5.8 - about half the productivity two decades ago.

— Darryl D'Monte
(From "*Temples or Tombs*")

During the five years from 1974 to 1979, fertiliser consumption doubled from 2.5 million tonnes to five million tonnes, while the peak food output rose from 108 million tonnes to 132 million tonnes, an increase of 22 per cent.

Dr. Dhua, Chief Agronomist of the Fertiliser Corporation of India, pointed out earlier through the Oil Commentary (April 15, 1973 issue), the harm caused to the plants and crops by the excess application of nitrogen in relation to the organic matter in the soil. He said there is a carbon-nitrogen balance in the soil, as well as, in the plants; hence a higher dose of nitrogen in the organic matter deficient soil will mean that the excess nitrogen will not be used by the plants or retained by the soil. Moreover, excess nitrogen produces greater water loss through transpiration and even wilting of the plant; the cells become dilated and thin-walled and hence vulnerable to pests and diseases; the cell sap too, becomes weak causing tastelessness. The proneness to water loss destroys the crop's resistance to drought.

System 'fallowing' in the U.S.A. (which they can afford) gives rest to the soil and helps restoration of the soil by natural process. It has, therefore, been able to stand the use of chemical fertilizers. Of course, there have been many land areas in the U.S.A. which have been reduced to dust bowls due to injudicious use of fertilisers. The very fact that a protest movement is growing in the U.S.A., a country with no long history of cultivation, shows that the deleterious effects of chemical fertilizer uses have been quite serious. If the same were to be practised in countries as with a several millenia-old history of cultivation, a tropical climate and soil conditions as in India, the results would be disastrous.

– S.N. Ghosh

Success of GM crops claims under fire

NEW DELHI: Contesting the success claims of transgenic cotton trials, Gene Campaign's Suman Sahai and Shetkari Sangathana's Wardha leader Vijay Jawandhiya have demanded a public debate on genetically-modified crops and a comprehensive policy on this.

"There has been no public debate," said Sahai, "on whether India wants to be a GM country or not. There has been no process to decide that if we go GM, then for which crops and which traits. Instead, we appear to be emerging as the testing ground for crops developed by corporations which are designed for industrial agricultural economies and have no bearing on our food and agriculture needs."

She called for a moratorium not on the science of GM but on the release of GM crops. Regulatory procedures must be transparent and effective, crops have to be relevant to India. Otherwise, even an assured Rs 2,200-crore soyabean market could collapse, she said.

On Wednesday, Jawandhiya detailed his experience of visiting one of nine sanctioned trial plots of transgenic Bt cotton. The crop on this one-acre plot had, he said, been a "total failure". Non-GM cotton has been hit by heavy bollworm attack this year but so has Bt cotton, which is supposed to be resistant to this pest. So, what is the difference? asked Jawandhiya. Bt cotton plots, too, needed pesticide sprays - for pests it is supposed to be resistant, as also it is not. Why not opt then for integrated pest management?

When he questioned scientists, said Jawandhiya, he was told the original seeds had been developed, stabilised into a hybrid - and the effect, therefore, had been diluted.

This is, said Sahai, too strong and too controversial a technology to be subject to ad hoc, knee-jerk reactions. Seventy per cent of the people depend on agriculture, most of them are small farmers, and the implications of GM are long-term and probably irreversible, Sahai said. We can afford to make a mistake in the auto sector but not in the agriculture sector, she added.

The second point, she said, is that developing countries like India are centres of diversity, unlike the US, and centres of origin, from where major food and cash crops have developed. Such countries cannot afford the same risks as others can.

Source : *Times of India*,17th Jan 2002

The Way to Survival

(On breaking the deadly addiction to chemical fertilisers & pesticides)

We are living in a world where human beings have adopted a lifestyle, which in the name of progress and development, takes us towards death and destruction.

The whole concept of green revolution, applying the practices of industry to agriculture, is the stark example of over-exploiting croplands. Chemical fertilizers have become the main components in agricultural production ignoring the truth that soil is not dead matter, but a community of living things — bacteria, earthworms etc.

Today our farms have become addicts. Nothing can be produced till the farmer satisfies the farm's devilish demand for chemical fertilizers. The analogy of the human body applies to the soils. When the human body loses strength, it cannot resist the attack of pests. Thus came the chemical pesticides. When chemical pesticides are applied, other living beings, which in a natural system control the pests and maintain the ecological balance, fall prey to these poisons. The extinction of frogs, snakes and owls is a glaring example of this. Everybody is familiar with the role of frogs and snakes in controlling the pests, but very few know about the owl. Dada Salim Ali once told me, "Do you know how useful the owl is to us? An owl preys upon at least three rodents in the night. A pair of rodents reproduces seven hundred in a year. It is said that five rodents destroy as much food as is enough to feed a person.

In the past, agriculture was culture. But now agriculture has become a commercial venture which has proved to be ecologically disastrous. The main force behind unnatural farming is the industrial interest. Farmers today have become solely dependent on outside inputs and thus most of their earnings goes to the industrialists. They have become the bonded labourers of the industries and bankers. It only seems to be economically advantageous because of Government subsidies on inputs and the failure to calculate hidden costs like soil damage, health problems and high irrigation needs.

The other aspect of this problem is more frightening.Our farming system has become more and more water consuming. The world wide scarcity of water is an established fact. According to the World Watch Institute Studies, per capita availability of water by the end of this century will be 24% less as compared to 1983. India is on the margin. How quickly the availability of water is decreasing is clear from the figures given by Madhav Chitley, Chairman of Water Commission. Per capita availability of water in India in 1901 was 9404 cubic meters. It came down to 6972 cubic meters, i.e., approximately 26 percent less than in 1941, and then down to 3243 cubic meters in 1981, i.e. 65% less. **Per capita availability of water in 2001 will be 14 percent as compared to 1901**.

It is not only for irrigation that chemical farming needs more and more water. Fertilizer plants too consume excessive water. The plant of Gujarat State Fertilizer Corporation, the refinery adjacent to it, and the plant of Indian Petro Chemicals Ltd., consume every day 350 lac gallons of water, which means 117 lac pots of drinking water every day. **Considering an average consumption of even 10 pots a day per family, this water can meet the needs of 11.7 lacs rural families.**

The survival and evolution of civilization lies in the hands of a creative minority. They not only have to cope with the challenges to which the society is exposed, but also to carry along with them the majority of their people. We are marching from 'Death to Life' and our slogan is 'Yes to Life. No to Death.'

— Sunderlal Bahuguna

(Shri Bahuguna is the widely respected leader of the Chipko Andolan which focused world attention on the urgent need to protect the Himalaya forests.)

GREEN REVOLUTION & HUNGER

1. **Seeds and Food Security**, 85 pp, Rs. 20/-, Pub: Sahabat Alam, Malaysia
   (On erosion of genetic resources and the dangers of hybrid monoculture)
2. **Seeds of Plenty, Seeds of Want** by Andrew

Pearse, Rs. 200/, Pub: Oxford University Press (Aspects of the Green Revolution)

3. **Perverse Development** by Ernest Feder, 324 pp, Rs. 60/- Pub: Foundation for Nationalist Studies [Supported by well-documented data & using as reference the agrarian experience of the Philippines - one of the World Bank's showcases in the transformation of the countryside - the author bares the hypocrisy of the 'anti-poverty' schemes being implemented in capitalist Third World countries under the aegis of the agribusiness transnationals, World Bank, Asian Development Bank, IRRI and other Western institutions]
4. **Empty Stomachs & Packed Godowns** by Bharat Dogra, Pub: Author, Rs. 301- [Aspects of the food system in India]
5. **The Great Divide** by Colin Regan & Bob Kenny, Pub: VNS
6. **Punjab: Grass-Root Problems & Solutions** by Bharat Dogra, 80 pp. Rs. 8/- Pub: S.B.S.C., Punjab [Reports on the agro-ecological crisis engulfing Punjab and the impact of this on the ordinary life of people]
7. **World Hunger** by Henry J.D'Souza, 37 pp, Rs. 20/-, Pub: Development Resource Centre (World hunger, argues the author, is closely linked with the capitalist mode of production]
8. **How the Other Half Dies** by Susan George, £3.50, 352 pp, Pub: Penguin Books [Why are so many people hungry and malnourished? The author affirms with conviction, and with solid evidence, that it is not because there are too many passengers on 'Spaceship Earth', nor because of the bad weather or changing climate but because food is controlled by agri-business that puts profits before people]
9. **Food First** by F. M. Lappe & Joseph Collins, 416 pp, £3.50, Pub: Abacus [A radical, hard-hitting survey of world food resources and their allocation. Shortages and famines in developing nations are not caused by natural disasters but by multinational greed on an enormous scale]
10. **Diet for a Small Planet** by Frances Moore Lappe.

Pesticides : The super-pest

3,75,000 cases of human poisoning by pesticides are reported each year from developing countries - with some 10,000 deaths. Many more cases go unreported.

The value of pesticides imported by the Third World countries during 1974 was $ 641 million. This figure went up to $ 1,000 million by 1978. In addition, several developing countries are now producing their own pollutant organochlorine compounds, highly toxic organo-phosphorous insecticides and a few hazardous fungicides and herbicides.

Local production of pesticides in developing countries - unless closely monitored - can entail additional risks to public health because the processes of synthesis may differ from the original ones. This can give rise to other toxic compounds which remain as impurities at dangerous levels.

Volatile herbicides sprayed on sugarcane plantations can easily be carried away by the wind and in the process destroy neighbouring crops like cotton, tomatoes and papaya. Over-intensive aerial application of pesticides are known to pollute the air and affect people in nearby towns, causing nausea, dizziness and headache.

Organo-chlorine pesticides such as DDT, aldrin, dieldrin, chlordane and heptachlor remain in the soil for many years and even decades. They are progressively transferred from the soil to edible crops, to grass and eventually to cattle. Residues are also found in vegetables, grains, fruit, meat and milk.

The widespread use of persistent pesticides and the presence of their residues in food have resulted in them being stored in almost every human being. They reach a steady stage in the body tissues proportional to the level of daily absorption. A decrease in the organo-chlorine body burden has been observed in the industrial countries as a consequence of the banning or restriction of use.

Studies have shown that residue levels of DDT and BHC pesticides in samples of human breast milk are much higher in India, China and Mexico than those detected in Sweden, the USA and

Yugoslavia.

The indiscriminate and extensive use of pesticides in agriculture has been responsible for the development of resistance in agricultural pests - which are now resistant to many organo-chlorine and organo-phospherous insecticides. So compounds of different chemical groups are now required to control these pests.

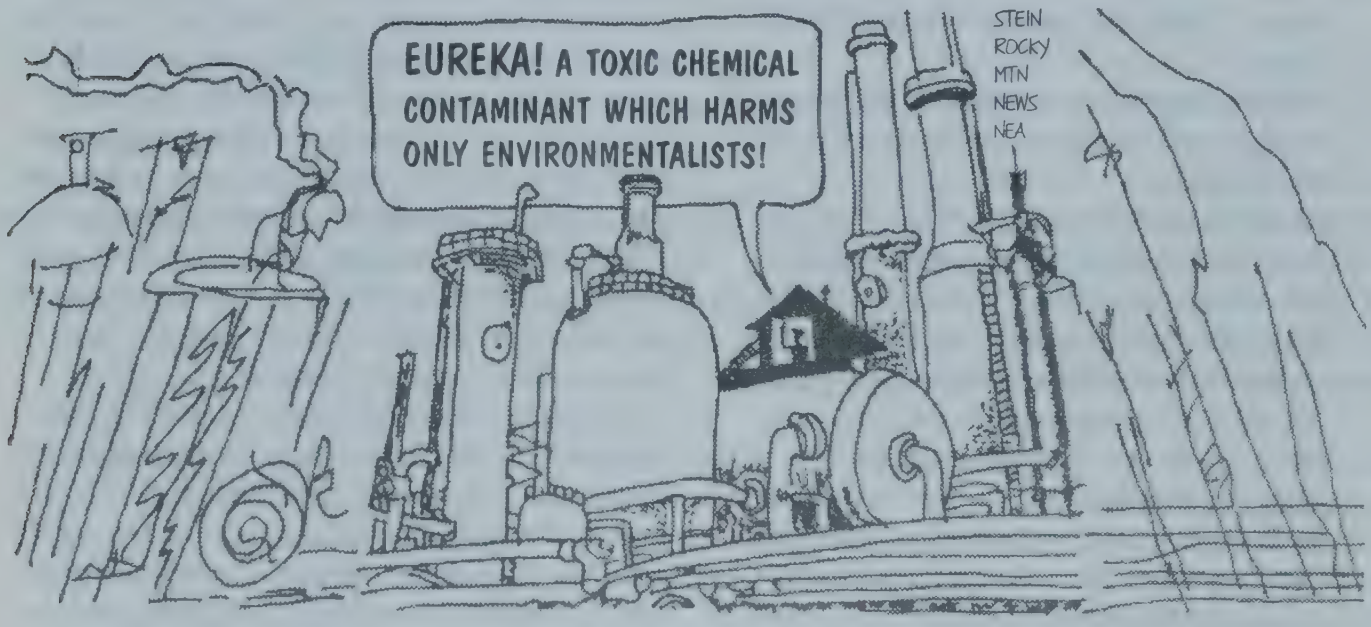
There are at least a million species of insects on earth. The vast majority - more than 90% of these - are quite harmless or often beneficial in several ways. By our indiscriminate use of chemical pesticides, we have been killing many great friends of the farmer.

It has been found that the total number of pest species may increase because predators have been exterminated by pesticides. In such cases, crop damage may be even more severe than before the chemicals were used. In Central America, the number of major cotton pests actually rose from two to seven in the first 10 years of pesticide use, and the number of pesticide applications rose from two to 20 per season as a result of predator mortality and pest resistance.

Insects, with their inbuilt genetic diversity and being able to breed rapidly, are able to evolve strains resistant to chemical fungicides. As the pests multiply, their ability to withstand pesticides are passed on to their offspring until a larger proportion of the pest population is resistant to the original pesticide.

The farmers' first response to pests resurgence is to spray more. This leads to more problems and more sprays. It turns into a vicious circle that spells doom.

M.G. Srinath



•... Tragically, Bhopal is being repeated. ... as "mini-Bhopals", smaller industrial accidents that occur with disturbing frequency in chemical plants.... Ever more deadly are the "slow-motion Bhopals" where unseen and chronic poisoning from industrial pollution ends in irreversible pain, suffering and death.

— David Weir
(From 'The Bhopal Syndrome')

•... Spraying kills off the weaklings. The only insect survivors are insects that have some inherent quality that allows them to escape harm. These are the parents of the new generation, which, by simple inheritance, possess all the qualities of "toughness" inherent in its forebears. Inevitably, it follows that intensive spraying with powerful chemicals only makes worse the problem it was designed to solve.

— Rachel Carson
(From "Silent Spring")

The International Register of Potentially Toxic Chemicals (IRPTC)

The IRPTC was set up in 1976 by the United Nations Environment Programme (UNEP). Its Geneva-based central unit collects, stores and disseminates data on chemicals, and operates a global network for information exchange. The IRPTC network consists of national correspondents (governments of over 100 countries have appointed at least one civil servant or scientist to assist IRPTC), national and international institutions, industries and external contractors. Before Bhopal, IRPTC fielded at least one query a day from a developing country, often on the handling of toxic substances, sometimes relating to accidents. Since Bhopal, it has been receiving hourly calls. It can be contacted at:

IRPTC/UNEP
Palais des Nations, 1211 Geneva 10, Switzerland
Tel: (22) 988-400, Ext. 304/306, Telex: 28877

The United Nations Consolidated List of Products whose Consumption and/or Sale have been Banned, Withdrawn, Severely Restricted or Not Approved by Governments (commonly known as "The List".
Published in September 1984, the list identifies some 500 products from 60 countries, indicating specific legal action taken and manufacturing data.The sectors covered by the list are: pharmaceuticals, combination products, agricultural chemicals, industrial chemicals, and consumer products. It may be obtained free of charge from :

Mr. Peter Hansen
Assistant Secretary-General
United Nations, PPCP-DIESADC-II
1820 New York, N.Y. 10017, U.S.A

PESTICIDES & POLLUTION

1. **Silent Spring** by Rachel Carson, 317 pp, £ 3.25, Pub: Penguin Books.
   [A scientifically argued and impassioned exposure of the effects of indiscriminate crop-dusting with insecticides, of the destruction of wildlife and of the balance of nature, of man's progressive poisoning of his own habitat. Remains the classic statement which founded a whole movement and continues to focus concern.]

2. **A Growing Problem : Pesticides & The Third World Poor** by David Bull £4.95, Pub: Soil Association

3. **The Pesticide Poisoning Report - A Survey of some Asian Countries**, by Foo Gaik Gia, 80 pp, Rs. 25/-, Pub: IOCU
   [Examines what Indonesia, Malaysia, Thailand & Sri Lanka are doing to monitor the ill-effects of pesticide use on human health and on the environment]

4. **Pills, Pesticides & Profits - The International Trade in Toxic Substances**, 167 pp, Rs. 25/-,
   [Documents the export trade in banned drugs and pesticides, gives names of exporters and banned products. Also includes the PBS television documentary script: "Pesticides & Pills: For Export Only"]

5. **The Bhopal Tragedy** by Ward Morehouse and Arun Balasubramanian, 190 pp, Rs. 40/-
   [Perhaps the best account oi the Bhopal gas disaster and how it occurred]

6. **The Lessons of Bhopal** by Martin Abraham, 151 pp, Rs.110/-, Pub:IOGU
   [Essentially a community action resource manual on hazardous technologies)

7. **The Bhopal Syndrome** by David Weir, 117 pp, Rs. 25/- Pub: IOCU
   [IOCU commissioned David Weir to journey all around the world and report on potential Bhopals. A deadly indictment of the manner in which toxic processes are operated all over the globe. With an afterward by Claude Alvares]

8. **Nothing to Lose But our Lives** - Empowerment to Oppose Industrial Hazards in a Transnational World, 207 pp, Rs. 45/-
   [Ward Morehouse, Clarence Dias, Ayesha Kadwani & David Dembo get together to produce this excellent, informative book on industrial hazards and disasters, and possible responses]

9. **Atmospheric Biopollution** by Naresh Chandra, Rs. 200/-, Pub: Environmental Publications

10. **Current Pollution Researches In India**, ed. R.K. Trivedy & P.K. Goel, Pub: Environmental Publications

The Desertification of America

When our plane reached San Francisco air space, the first thing that raised doubts in me was the vista of single trees standing alone on the bleak, yellow land. Looking out of the car window as we drove from the airport to the city of Berkeley, I noticed that the mountains along the way were also the same drab, sandy color. The topsoil had washed out, leaving bare rock exposed.

The Californian plain is an endless stretch of dry, yellow land. Hour after hour, no matter how far you drive, that is all there is. The scenery doesn't change a bit. I found it odd that the grasses covering the plain were amber yellow rather than green.

The land is extremely poor and covered mainly with forage grasses such as foxtail and wild barley. Isolated trees of several types such as one might expect to find in a desert are scattered over the yellow plains. From time to time, a large field of tomatoes or some other crop, measuring hundreds of acres in size would emerge suddenly. But these were always irrigated. Wherever there was green, water was invariably being drawn for irrigation. Without irrigation, the fields turn into parched grassland.

The green one saw was imitation, and the agricultural products were the processed products of petrochemical inputs. Seven years ago, when I first came, I expressed my concern that the future of American agriculture was in serious doubt. My visit on this occasion only served to confirm that opinion.

Walking about on the land and digging for myself in the soil, I came to the conclusion that the soil in California had not always been poor. Even now, the land is not lean, but the soil near the surface is very seriously depleted. This is the result of irrigating the fields and working the soil with twenty- or thirty-ton machines, four, maybe five times a year until it becomes hard as clay. The sun bakes and dries this, creating fist-sized cracks in the surface of the field. It is only natural to expect that adding water, kneading, and drying would cause cracks to form.

But the ground at the corners of the fields, over which the heavy tractors don't pass, is soft, rich soil just like that in my own fields. I explained to one farmer that his soil had not always been poor. I told him that the soil had probably grown leaner each time the tiller had turned it over. Mechanized farming that assaults the land with chemical fertilizers and pesticides as well as machines, increasingly depletes the land.

Scientists today claim that livestock farming enriches the land. However, the truth of the matter is that wherever you look, this only depletes it. After talking with young people from Australia, India, and elsewhere, I've come to the conclusion that animal husbandry destroys the fertility of the soil. The question is why?

The Spaniards were the first to raise cattle in America. The land, which one would normally have expected to become richer as a result has grown poorer instead. In cattle ranching, because all the animal wastes are returned directly to the land, it may not seem possible that the land would grow leaner, but the fact is that it does. This is because the vegetation becomes less varied.

The application of modern farming methods further aggravates the problem, creating a negative cycle. In America, land is irrigated with sprinklers and forage crops grown there. These crops are nourished with chemical fertilizers, then harvested using large combines, and packaged and exported throughout the world as cattle feed.

The livestock raised in Japan is not fattened on Japanese feed. Cattle and hog farms receive their feed from America. By exporting all this feed, America is draining her lands of fertility. Those who don't know any better might be pardoned for thinking that America's livestock farmers are well-off. But that is just not the case. All they are doing is selling feed crops grown by applying petroleum-based products. The soil at their feet just keeps on growing poorer and poorer. Oh sure, they're making money. **But the steady impoverishment of the soil means that they are actually practicing deficit farming.**

When the soil gives out and the fields are abandoned by ranchers, fruit growers come in. They set up sprinklers on the weary land, spread chemical

fertilizers, and grow plums, apricots, and oranges. This no longer is crop production under natural conditions; it is farming based on petroleum energy. Even the water, although sometimes drawn from nearby sources, often is piped in from hundreds of miles away.

From an airplane, it is clear that the third of the American continent east and west of the Rockies is a total waste-land, a reddish-brown desert. The image it brought to mind was of a flaming inferno. At 35,000 feet, what you see are circular farms measuring a half-mile across, irrigated by huge, center-pivot sprinklers. These are very much like oases in the middle of a desert. And would you believe that America has 80,000 of these? Incredible.

Going further east, there is no doubting that the land along the shores of the Mississippi River is a grain belt. But from the sky, the pattern of monoculture is all too clear. Fields of corn, wheat, and soyabeans spread out below as far as the eye can see, leaving a vivid impression of the great expanse of the American "bread basket". The land is divided in checkerboard fashion into large, modern farms, but these are fields of death that have suffered the relentless injuries of heavy machinery, chemical fertilizers, and pesticides.

The soil has been pulverized by large tractors and the organic matter consumed and exhausted. Few microbes exist in the soil and when there is rainfall, the topsoil washes away at an alarming rate of perhaps ten or more tons per acre every year. Most U.S. farmland is hilly and rolling. There are no terraced rice fields or reservoirs as in Japan, so the soil just continues to wash out. When the loose soil dries, it is carried off by the wind as dust and scattered. And, as I have already mentioned, irrigation with those enormous sprinklers brings salt up to the ground surface, where it accumulates.

The land lacks the fertility to produce crops continuously year after year, so each year from one-third to one-half of the fields are left fallow. That is why, from the air, the land shows an alternating pattern of green and brown stripes.

Modern farming stresses labor productivity and efficiency. An inevitable outcome of this is the continuous monocropping of wheat or corn by large farming operations. This depletes soil fertility, setting into motion a negative cycle that becomes a basic cause for economic failure as well. Modern chemical farming amounts to no more than essentially slash-and-burn agriculture in total disregard of nature, with the yield ratio (the ratio of energy yield to energy input) halving every ten years. Today, only one half of the energy poured into the land is recovered. To harvest one calorie of food energy, farmers are putting two into the land. Far from raising productivity, American agriculture can be better characterized as an industry striving to curtail declines in production. Roughly speaking, 30% of the American continent is desert, with the central grain belt accounting for another 30%, this land is not stable however. Though it can be said that 30% of the country is wilderness, it is nearly all forestland, located on the east coast. About 10% of the country is logging forest, but this can only be seen in areas like the northern part of Washington State.

To put it simply, more than half the country is in the process of becoming desert. In fact, it may be that the desert problem in America is greater than that of Africa. But the great majority of Americans have no conscious awareness that such a thing is happening to their country. They regard the failure of rains in summer, the withering of the grasses and the browning of the fields, as inevitable. They find it hard to believe when I tell them the grass is not dying but resting, and that despite the fact that the Japanese summer is also hot, it is the season of the deepest green. They seem to be so overwhelmed by the vastness of their country that they feel no desire to preserve it. It is reported that one-third of the rural population have given up and left the land, causing a large number of banks to go bankrupt along with them.

Once the health of the land has declined and desertification has begun, it does not matter how much petrochemicals you pour into the system, it will not result in bringing affluence to the rural population. Sad though it may be, that point is generally not well understood.

What follows is worse: once a plot has been abandoned and the grassland has withered, soil temperature begins to rise due to radiant heat and the land becomes scorched. When we did a comparative investigation of temperatures above grassland and those near forestland, we found differences of 20- 30 degrees F were common. When the temperature had reached about 30 degrees above the established grassland, it was sometimes

as much as 70-80 degrees in the case of the withered grassland. On the assumption that the surrounding area would be affected by the action of reflected heat, it occured to me that measures for greening the desert, such as the planting of daikon (giant white radish), should be implemented without delay.

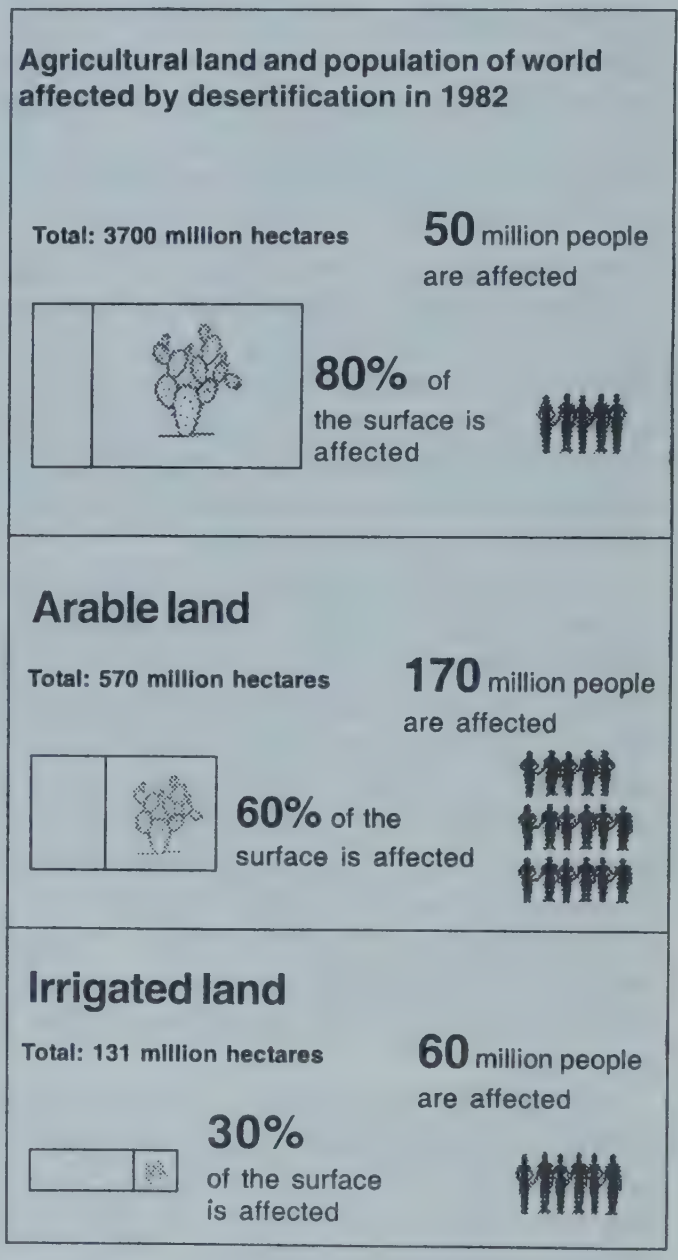
As it turns out, American farmers with their properties of two and three hundred hectares have lower incomes than the average Japanese farmer with only one or two hectares. The reason they are poorer is because they have forgotten nature, they refuse its support and are ruining the land by relying on petroleum energy instead. It is perhaps not wrong to say that this is due to the fact that it is the trading companies that are directing cultivation methods and product marketing. However, production of high earning crops in artificial environments, and the commercial style of agriculture that Japan advocates will, in the end, probably also share the same fate.

Clearly, the resurrection of American agriculture must proceed in hand with measures to control the spread of the desert. The greening of the desert can then be a starting point for a 'real' regenerative agriculture.

-Masanobu Fukuoka

Masanobu Fukuoka is the author of the celebrated modern classic 'One Straw Revolution', which, over the last decade, has quietly slipped into the ranks of an international best-seller. It has been translated into more than 12 languages and has inspired many people all over the world. At a young age, Fukuoka abandoned his career as a brilliant laboratory scientist researching plant pathology. He started experimenting with natural farming, following the strategy of minimum interference and careful observation. Tilling, weeding, chemicals and compost were totally dispensed with. Instead, he tried various plant combinations and inter-cropping patterns. The regenerative approach brought high yields of fruit, grains and vegetables with minimal inputs of external energy. This method is dealt with in considerable detail in 'The Natural Way of Farming'. Fukuoka's third book, 'The Road Back to Nature' (Japan Publications), covers his travels to America, Europe and Africa. He visited India for a month in January '88, when he was invited to address the Platinum Jubilee of the Indian Science Congress and to receive the Deshikottama Award from Vishwa Bharati University, Shantiniketan. The same year, Fukuoka also received the Magsaysay Award for his out-standing work in the field of agriculture.

Deserts are extending


Agricultural land and population of world affected by desertification in 1982
Total: 3700 million hectares
50 million people are affected
80% of the surface is affected
Arable land
Total: 570 million hectares
170 million people are affected
60% of the surface is affected
Irrigated land
Total: 131 million hectares
60 million people are affected
30% of the surface is affected

Source : UNEP *Strahm Peter Hammer Vertag*

Seeding a Real Green Revolution

We must stop the desertification of the earth. Today, the global loss of vegetation is not something that can be mended with passive ecological movements to save nature. We must recognize that desertification arose from the efforts of materialistic civilization and modern agriculture. And now we must strive to effect sweeping and revolutionary changes in agriculture. Particularly urgent are measures for the greening of deserts on a massive scale.

The quickest way to regenerate the land is to scatter green manure and vegetable seeds beneath any existing trees, inter -plant some green manure trees and leave the place uninhabited. Man and large domestic animals are enemies of the land.

Let me explain. Land worked by farmers and grazed over by livestock weakens; the variety of animals and plants it supports, declines. When man comes in and cuts the grasses, these no longer scatter seed; and because he eats and carries out vegetables and fruit from the farm, seeds from these do not fall to the soil. The starting point appears to be whether the seeds increase in number or decrease.

If I were asked for advice on reclaiming the deserts, I would suggest that first a large-scale test be conducted in which the seeds of many different kinds of plants are collected, including those native to the region. A large quantity of these seeds should be scattered over as wide an area as possible, just before the rains or immediately after any showers. Leguminous species and plants like the daikon (giant white radish) are particularly promising.

This may seem a brash and foolish method, but it can pull the land out of a hopeless state. I would like to stress that when something like this is attempted, it must be done over a wide area. When the seeds are sown over a broad stretch of land, even if 99 percent fail, some of the seeds will take somewhere. This germination will give us precious clues. Also, seeding should be continued with the full expectation that this will fail again the following year. Anything that shows even a one percent survival rate should be seeded again the second and third year. Concentrate initially on plants that will grow in the desert; then try gradually increasing the variety and quantity of vegetation. One must ask what will grow now in that ground, then find the answer to this question by sowing many different types of seeds.

This is an offering by man to nature. In sowing the seed, man is not growing the plants; he is supplying the materials with which nature can teach him. In a sense, it is an offering to the deities. Man is having the god of the land feast on what he likes. If the god likes what he eats, he teaches man: "This is good here."

The urgency is great, for the desert areas are large and spreading fast. Let us scatter the seeds of various drought hardy grasses, trees and food crops by airplane over those areas on earth that have turned to desert. We must work fast, or we may be caught in a situation of too little, too late.

— Fukuoka

Stop The Desert !

Arid lands are areas where direct evaporation exceeds rainfall, and where annual precipitation averages fall below 80 cms, and as low as 1 cm (sometimes only as dew).

The development of conservative strategies for the preservation of dryland species, and for the responsible human-use and management of arid lands is probably the world's most pressing problem in landscape management. Only sporadic world attention is given to famine or drought in areas, with such "sudden" emergencies consuming great quantities of resources and finance, much of which is wasted in mismanagement.

... Problems of aridity, slated soils, and long-term drought can always be expected where we venture into desert borders with pastoralism and cropping. In addition to the natural background fluctuations of rainfall, we, as exploiters, add deforestation, soil erosion, and the consequent salting of waters and soils. All desert areas now are extending; many dryland-areas are being created, and antecedent plant and animal species

are thereby brought to extinction.

...Instead of concentrating on exotic water in deserts (through expensive engineering projects for irrigation), we should attempt to increase the input of water into the aquifers, soils, and streams; and to re-humidify the desert-air by planting trees and protecting existing vegetation. It is the presence of trees and shrubs, transpiring rather than evaporating water, that keep the desert salts from evaporating at soil level. Once evaporation alone operates, capillary action quickly brings subsurface salts to the surface as magnesium, sodium, calcium, and potassium compounds (chlorides, sulphates, carbonates) and we can no longer establish vegetative cover.

... It is important to specify pioneering and drought- hardy plants for many situations, and why any strategy to get water into soil, and keep it there, is worthwhile.

(Extracts from chapter on dry land strategies in '*Permaculture : A Designer's Manual* ' by Bill Mollison)

The Permaculture Quest

To many of us who experienced the ferment of the late 1960's, there seemed to be no positive direction forward, although almost everybody could define those aspects of the global society that they rejected, and these include: military adventurism, the bomb, ruthless land exploitation, the arrogance of polluters, and a general insensitivity to human and environmental needs.

From 1972-1974, I spent some time (latterly with David Holmgren) in developing an interdisciplinary earth science (permaculture) with a potential for positivistic, integrated, and global outreach. It was January 1981 before the concept of permaculture seemed to have matured sufficiently to be taught as an applied design system, when the first 26 students graduated from an intensive 140-hour lecture series. Today, we can count thousands of people who have attended permaculture design courses, workshops, lectures and seminars. Graduates now form a loose global network, and are effectively acting in many countries. The permaculture movement has no central structure, but rather a strong sense of shared work. Everybody is free to act as an individual, to form a small group, or to work within any other organisation. We cooperate with many other groups with diverse beliefs and practices; our system includes good practices from many disciplines and systems, and offers them as an integrated whole.

Great changes are taking place. These are not as a result of any one group or teaching, but as a result of millions of people defining one or more ways in which they can conserve energy, aid local self-reliance, or provide for themselves. All of us would acknowledge our own work as modest; it is the totality of such modest work that is impressive. There is so much to do, and there will never be enough people to do it. We must all try to increase our skills, to model trials, and to pass on the results. If a job is not being done, we can form a small group and do it (when we criticise others, we usually point the finger at ourselves!) It doesn't matter if the work we do carries the "permaculture" label, just that we do it.

By 1984, it had become clear that many of the systems we had proposed a decade earlier did, in fact, constitute a sustainable earth-care system. Almost all that we had proposed was tested and tried, and where the skills and capital existed, people could make a living from products derived from stable landscapes, although this is not a primary aim of permaculture, which seeks first to stabilise and care for land, then to serve household, regional and local needs, and only thereafter to produce a surplus for sale or exchange. To empower the powerless and create "a million villages," to replace nation-states, is the only safe future for the preservation of the biosphere. Let interdependence and personal responsibility be our aims.

— Bill Mollison

(From preface to '*Permaculture : A Designer's Manual*')

• In a world where we are losing forests, species, and whole ecosystems, there are three concurrent and parallel responses to the environment :

1. **Care for Surviving Natural Assemblies**, to leave the wilderness to heal itself.
2. **Rehabilitate Degraded or Eroded Land** using complex pioneer species and long term plant assemblies (trees, shrubs, ground covers).
3. **Create our own Complex Living Environment** with as many species as we can save, or have need for, from wherever on earth they come.

Permaculture as a design system deals primarily with the third statement above, but all people who act responsibly in fact subscribe to the first and second statements. That said, I believe we should use all the species we need or can find to use in our own settlement designs, provided they are not locally rampant and invasive.

We are fast approaching the point where we need refugees for all global life forms, as well as regional, national, or state parks for indigenous forms of plants and animals. While we see our local flora and fauna as "native", we may also logically see all life as "native to earth". While we try to preserve systems that are still local and diverse, we should also build new or recombinant ecologies from global resources, especially in order to stabilise degraded lands.

Bill Mollison *(From 'Permaculture : A Desiginer's Manual)*

Green Alert!

I see several priorities for us, as permaculturatists, to address. One is the preparation and dissemination of information for appropriate action on all levels; from the person-on-the street/in-the-paddock, to government and corporate sectors. Inseparable from this are our internal networks and links with other organisations to co-ordinate action and information flow more effectively. With these in place we are well prepared for a major campaign to empower people with the knowledge that there are indeed solutions, that they can pull their heads out of the sands of shock and do something.

Then the real action begins, and the people with working skills and knowledge will really be in demand. Those of us presently committed to action cannot cope with the demands arising from low key exposure - so imagine what a high profile awareness campaign will do. One can only ask : are you ready? If not, are you preparing yourself ? If not, then what on earth are you doing?

- Robyn Francis
(Editor, International Permaculture Journal)

Every five or ten minutes, the ground shuddered like a drum in the dark at the hard impact of rauli, manui and larch trees, giant works of nature, seeded there by the wind a thousand years before. Then the saw sectioning the bodies of these giants struck up its whine...
The forest was dying. I heard its lamentations with a heavy heart, as if I had come there to listen to the oldest voices anyone had ever heard. — Pablo Neruda, Memoirs

Man of The Trees

Richard ST. Barbe Baker's Centenary

On October 9, 1989 falls the 100th birth anniversary of Richard St. Barbe Baker, popularly known all over the world as the 'Man of the Trees'. Born in England in 1889, Baker joined the Forestry Service in Kenya in 1921. Here he founded the International Conservation Group "*Men of the Trees*" in 1922. He went around the Sahara and warned the concerned governments on the dangers of the spreading of the desert. In 1932 he joined "Save the Red Woods" campaign in U.S.A. He finally settled in Mount Cook Station in New Zealand from where he campaigned for saving the world's forests and arresting the spread of deserts through massive tree-planting programmes. He died on June 9, 1982, in Saskatoon, Saskatchewan in Canada.

St. Barbe travelled all over the world persuading various governments to save the forests and creating consciousness amongst the masses. He advocated the importance of forests for oxygen. He was a saint-scientist and a great friend of India. He met Gandhiji in 1914 and later met Rabindranath Tagore, Pandit Jawaharlal Nehru, Acharya Vinoba Bhave, Rukminidevi Arundale and several other great Indians during his subsequent visits.

In 1977, at the age of 88, when he visited India to participate in the International Vegetarian

Congress, he went to the Himalayas to bless the Chipko Movement and gave his scientific support to Chipko's demand for a moratorium on tree feelings in the hills. In 1980, when he heard about the destruction of the Silent Valley, he declared his intention to go on a fast unto death to save the Silent Valley. Mrs. Indira Gandhi assured him that the Silent Valley will be saved. He popularised the story of Amrita Devi and the sacrifice of 363 Vishnois in 1730 to save the trees and the Chipko slogan. "What do the forest bear ? Soil, Water and Pure Air."

At this moment, when forests all over the world are threatened with extinction, Baker's message comes as a reminder to the people of their foremost duty to save the forests for the survival of our dying planet.

St. Barbe's centenary is being celebrated all over the world. 'The Men of Trees', U.K. is holding an international conference in July. In India, the beginning of the centenary was marked by planting a memorial forest in Tara near Bombay on October 9,1988, and dedication of a symposium on trees by the Indian Society of Tree Scientists. We are trying to produce some material on his life and mission, and getting the film on his life, "Man of the Trees" dubbed in Indian languages.

We appeal to you to make suitable programmes beginning from 'World Forestry Day' - March 21 to October 9 1989 to create consciousness among the masses for the conservation of nature. His prayer for the trees should be popularised. St. Barbe Memorial Parks and Tree Crop farms may be established; besides a comprehensive programme to popularise forestry for Soil, Water and Air.

N.C. Bose, Vice Chancellor, Visva Bharati
Duleep Matthai, Vice-Chairman, National Wastelands Development Board
N.D. Jayal, Director, Natural Heritage (INTACH)
Kisan Mehta, Save Bombay Committee
P.K. Khosla, Secretary, Indian Society of Tree Scientists
Sunderlal Bahuguna, Chipko Information Centre, Silyara

• Rapid cutting of tropical rainforests is now getting the attention it deserves. The situation, we are told, is grim. Recent evidence suggests that deforestation is accelerating in most developing countries. Forest and woodland areas declined 24% in Africa and 38% in Central America between 1950 and 1983. In South Asia, woodland and forest areas dropped 27% between 1950 and 1980.

•...Deforestation must ultimately lead to climatic change. It has always done so in many areas on a local level. But there is now every chance that further deforestation could lead to a global and irreversible climatic catastrophe. Already in the 1977 conference at Reykjavik, four of the world's leading climatologists, Kenneth Hare of Canada, Hermann Flohn of West Germany, Tom Mallone and Reid Bryson of the USA declared that if we continued burning fossil fuels and cutting down forests at the present rate, a global catastrophe was inevitable, a view which is now shared by most serious climatologists.

(From the "Open Letter to Mr. Clausen, President of the World Bank" by Edward Goldsmith, editor, The Ecologist.)

• ... The unique Chipko movement started initially as a popular protest by local villagers against the indiscriminate felling of forest trees by "chipko-ing' or hugging them. Since the labourers could not axe the trees without injuring the people clasping them, again and again they were forced to withdraw. The movement has gradually expanded into one for improving the general ecological conditions in the hilly regions of the Garhwal Himalayas, side by side with the economic amelioration of the inhabitants who depend for their livelihood on the "sagacious" management of forests. At a time when forests everywhere in the country are being thoughtlessly despoiled through the short-sighted cupidity of the governments of the day, on the pretext of often dubious economic development, this is an exemplary exercise. In the context of failure to impress on political masters the folly of precipitating short-term solutions, direct action of the Chipko variety seems the only effective answer.

— Salim Ali

(From Preface to "*Forests & People*' by Bharat Dogra)

For me, trees have always been the most penetrating teachers. I revere them when they live in tribes and families, in forests and groves...They struggle with all the forces of their lives for one thing only: to fulfill themselves according to their own laws, to build up their own forms, to represent themselves. Nothing is holier, nothing is more exemplary, than a beautiful, strong tree.

—Herman Hesse

...Huge monoculture plantations of eucalyptus are an ecological menace because they rapidly devour nutrients from the soil, which thus become unavailable for the growth of other plants in the vicinity.

—Bharat Dogra

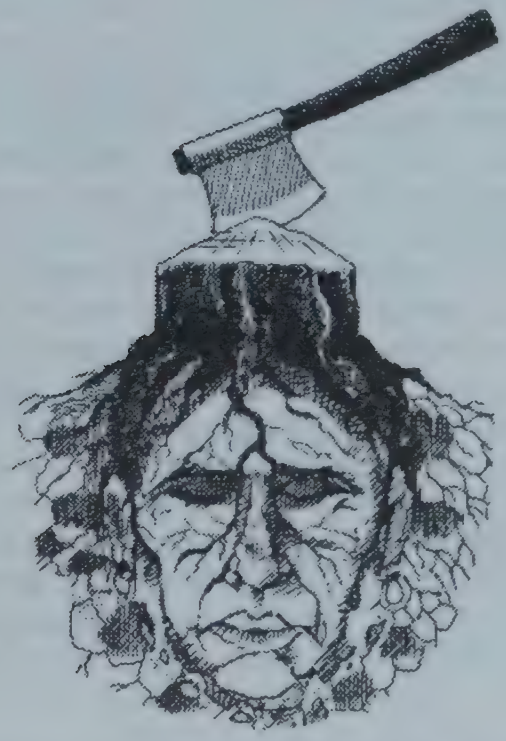
(From "Forests & People')

200 Million Trees Campaign Reaches Target

The 200 million Tree Campaign was launched in September 1985 with a target of seeing 200 million trees planted in Australia by the end of 1988. The committee has recorded over 201 million. Let's hope the inspiration to put trees in the ground spread everywhere.

PAPER TAX FOR TREES

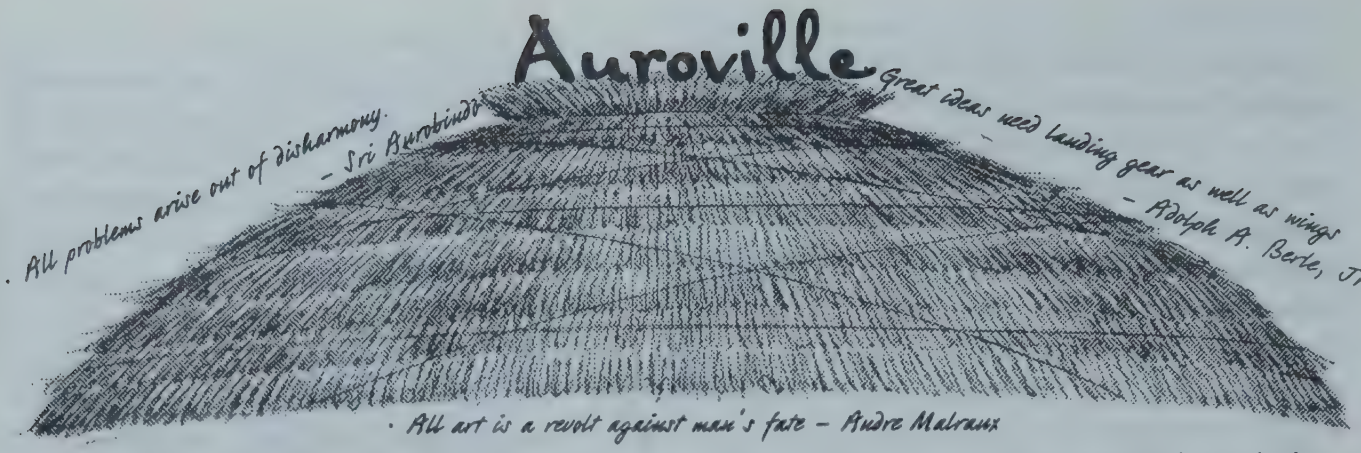
Each volume of every book from Tagari Publications carries a surcharge of 50 cents paid to the Permaculture Institute. The Institute (a public trust) holds the funds so generated in trust for tree-planting, and from time to time releases money to selected groups who are active in permanent reafforestation. Other ethical publishers too might like to consider compensating for the ecological damage done by the cutting of trees for paper.



The State of India's Environment Pub. C.S.E.

DEFORESTATION & DESERTIFICATION

1) **The Encroaching Desert :** The Consequences of Human Failure, 132 pp, Rs. 28/- Pub: ARENA. A Report for the Independent Commission on International Humanitarian Issues. [On the relentless spreading of the world's deserts, and remedies and policies to reverse the trend].
2) **The Vanishing Forest** : The Human Consequence of Deforestation, 89 pp, Rs. 20/- Pub: ARENA . [In addition to long-term consequences affecting all humanity, the disappearance of tropical forests is right now causing untold suffering and deprivation to large tribal populations living in and around these forests. People who lived for centuries in harmony with the forests are dying and so is their culture]
3) **Forestry Crisis & Forestry Myths** by Vandana Shiva, 55 pp, Rs. 15/- Pub: World Rainforest Movement . [Plays havoc with the anti-people Tropical Forests document of the Tropical Resources Institute and the World Bank]
4) **Forest Resources Crisis In the Third World**, 510 pp, Rs. 120/- Pub: Sahabt Alam, Malaysia. [36 impressive essays on various aspects of the forest resource crisis in different countries of the Third World including India]
5) **Forests, Trees & People** by Paul Freese & Thomas O' Brien, 110 pp, Rs. 25/-. [A preliminary report from the Philippines on the impact of industrial tree plantations and tree farming projects on small farmers]
6) **Towards A New Forest Policy** by Fernandes & Kulkarni, 156 pp, Rs. 25/- Pub : ISI. [Ten invaluable contributions to the nation's debate on a new forest policy]
7) **Forests, Environment & Tribal Economy** by Walter Fernandes & others, 363 pp, Rs. 50/- Pub : ISI. [Who cuts forests : tribals or industrialists, people or forest corporations? This study looks at forests from the people's point of view, and makes invaluable suggestions]
8) **Mother Nature** by N.G. Hegde, 20 pp, Rs. 5/- Pub : BAIF
[A simple story for children about the hazards of deforestation and how an individual commenced the process of regeneration. Colourfully illustrated]


Auroville
All problems arise out of disharmony.
– Sri Aurobindo
Great ideas need landing gear as well as wings
– Adolph A. Berle, Jr.
All art is a revolt against man's fate – Andre Malraux

Auroville is an international community that was initiated in 1968 with people from many parts of the world coming together & putting a handful of soil from their own country into an urn to symbolise human unity — which Auroville aspires for. About 150 kms. south of Madras, near the sea coast, Auroville is spread over an area of 20 sq. km. (12,000 acres). Approximately 900 members and 300 or so workers from about 30 countries in 50 settlements (some small with only 4/5 people some large with 300 — 400 people) live here. The Auroville area is not continuous and is interspersed with villages and public lands.

Auroville aspires for a life that is simple and self reliant. Work in Auroville is not seen just as a means of earning money; work here is seen as an integral part of life, of inner growth.

Naturally therefore, work has been done on many aspects of ecology and environment. In the beginning, the land on which Auroville started was mostly barren with a few Banyan, Neem, Palmyra and Mango trees. The first work that was necessary in order to live on this land was soil and water conservation. Extensive contour bunding, construction of small check dams and reafforestation were the methods used, and today, in the middle of an otherwise barren or bush-covered land, Auroville looks like an island of green. More than a million forest trees, hedge trees, fruit, nut and fuelwood trees have been planted on the 2,000 acres presently available for development.

During the last 5/6 years, many development workers, Govt. or semi-government officials and villagers from neighbouring regions have been coming in increasing numbers for visits, training and consultations on waste-land regeneration.

Initially, reafforestation was done through introduction of exotic species like Acacia auriculoformis, but 80—90% of the trees planted now are local. Seeds are collected regularly and small quantities are made available to other groups engaged in afforestation work in similar agroclimatic situations.

In the few small pockets, where relatively better soil is available, experimentation has been going on, on various methods of organic and biological agriculture as well as agroforestry. However, these have not been well documented and to learn about them you've to visit and talk to the persons involved in that particular type of work. For natural farming and agriculture in general you have to contact Bernard who stays at 'Annapurna', a new farm that's being developed for production as well as training; Charlie at 'Aurogreen' is the best contact for those interested in mixed crops of trees, vegetables and fodders. If reafforestation is your main area of interest, get in touch with Peter at 'Aurobrindaban' or Ed at 'Forecomers'. In general, when writing, you should address your correspondence to Ed *(C/o. Auroville Green-work Resource Centre, Isaiambalam School, Kottakarai, Auroville — 605 101)* who can arrange your visit or attend to your queries regarding training, etc.

Auroville has also done work on low cost housing (specially ferrocement construction), Biogas, wind and solar energy ... etc. The other major areas of work have been Education and Health, where many alternatives have been and are being explored.

"Earth needs a place where men can live away from national rivalries, social conventions, self-contradictory moralities and contending religions, a place where human beings, freed from all slavery to the past, can devote themselves wholly to the discovery and practice of the divine consciousness that is seeking to manifest itself. Auroville wants to be this place and offers itself to all who aspire to live the Truth of tomorrow."

— Mother

Ardhendu S. Chatterjee

Education for Co-evolution

• ...whisperings of nature...

This miracle unfolding
is some timeless realm...
this jewel earth
in a churning ocean
of cosmic time-space,
the myriad life-forms
throbbing
with mysterious wonder-spell

oh! a new-born babe!
O, mischievous child,
what future is yours?
what promises
lies hidden in you?

— Anna Dylan

• "All attempts to pressure children against the grain of their own impulses and interests are self-defeating in terms both of personality and intellectual growth."
— Keith Paton.

• "The spontaneous wish to learn, as shown in the child's efforts to walk and talk, should be the driving force in education."
— Bertrand Russel.

• "To know what we want in education, we must know what we want in general".
— T. S. Eliot

• The word **'education'** originates from the Latin roots e + ducere, ('e' meaning 'out' & 'ducere', meaning 'to draw'). Education thus means 'to draw out'.
(from 'Origins', a dictionary of the origins & roots of words)

• "Many of our arguments about educational organisation, equipment & techniques are based on our differing but often unspoken assumptions about the very nature of education - is it essentially concerned with putting in information, or drawing out human potential? Which path, in practice, do we follow?"
"For Gandhiji, 'Nai Talim' was the expression of the principle of non-violence in the educational sphere. It was the preparation for, and practice of, the peaceful organisation of a co-operative human community."
"At this stage of time, I would like to add a special emphasis - the life of the human family as a whole can only grow to its full strength and beauty by accepting and obeying the ultimate laws of the universe to which it belongs. The aggresive, selfish, careless exploitation by the human race of other forms of life, and of the resources of the world which is our home, wounds the life of the world."

— Marjorie Sykes
(extracts from 'Foundations of Living', published by Parisar, 1988. Marjorie, is an educationist/teacher who has worked with both Rabindranath Tagore and Gandhi).

• "There is no way to peace; peace is the way".

• "A school is as good as its teachers, provided they do not uncritically accept what they are about, and how, and why. It is not enough to be well-intentioned. We must have some idea of what sort of futures we want to make possible for our children to explore. To force them to adjust to our insecure perceptions of "the harsh real world" is to nip in the bud their innocent genius and the promise of joyful evolution that stirs in their bosoms."

- A mother, in an informal discussion on education & schools..

Education - Naturally !

• "To be educated well or badly, to learn by a long process how to cope with the physical environment and the culture of one's society, is part of the human condition. In every society, the education of the children is of the first importance. But in all societies, both primitive and highly civilised, until quite recently, most education of most children has occured incidently. Adults do their work and other social tasks; children are not excluded. They are paid attention to, and learn to be included.

Generally speaking, this incidental process suits the nature of learning better than direct teaching. The young see real causes and effects rather than pedagogic exercises. Reality is often complex, but the young can take it by their own handle, at their own times, according to their own interests and initiative. Most important, they can initiate, identify, be approved or disapproved, cooperate and compete without the anxiety of being the centre of attention; there is socialisation with less fear, or submission."

—Paul Goodman

(extract from 'The Underground and Education' - A guide to the Alternative Press, Published by Methuen, 1977).

Greening Young Minds

An Englishman nurtures children for an ecofriendly future

J SARAVANAN, Kodaikanal (Tamil Nadu)

Nestled in the serene environs of Palani Hills in Tamil Nadu — a stone's throw from Kodaikanal — there is a small school with a difference. Known as the Sholai school, this unique school generates energy for its entire campus from micro-hydels, wind and solar energy and has no connection to the Tamil Nadu Electricity Board. Besides, the biogas plant set up within the campus also caters to the daily energy requirement. Not just this, the school is also practising rainwater harvesting to tap the monsoon rains.

It all started in 1989. An Englishman Brian Jenkins for long toyed with the idea of starting a school where children could learn from nature and be given full freedom for individual growth. While sauntering through the Palani hills, he found it an ideal location for study and reflection. Brian published advertisements in the papers and recruited a few teachers who went around and mobilised students through word of mouth. The money came from Brian's inheritance. At present, Brain is investing nearly US $6,000 a month on the school. Brain feels that most of

the parents of these students are farm workers and to achieve financial self sustainability, the strength should be increased to 100 with more students from outside.

Initially the school had only six students. However, today the strength is 32. And these children (aged between 3 and 17 years) are being inculcated with knowledge of water conservation, non-conventional methods of energy, sustainable agriculture and lots more. Most importantly, this knowledge is not confined to books but is made functional. The students are given a free hand in selecting their subjects of interest and are "encouraged to study and learn on their own". What's more, students get individual attention as the student-teacher ratio is 7:1.

Nature education

The children studying in Sholai are already well-versed with solar photo-voltaic electricity. They are also involved in organic farming. Students have been allotted a small plot each where they have built a compost heap. This compost is

used to grow vegetables and all the food that the students eat is organically grown.

Sholai children have taken turns at measuring the wind speed at the top of a hill. They collected the data on the computers and printed out 18 graphs. Impressed at the results, an appropriate technology consultant Ram Subbu got a 10 kilowatt government subsidised wind generator for the local village.

Interestingly, the children also bring out a Tamil newspaper through which they generate awareness on various local issues. Sometime back, the children had suggested that by building latrines, the hookworm disease, which kills little children could be combated.

Adopting a Different Approach

E.F.Schumacher (author of the seminal book *Small is Beautiful*) learnt most of his intellectual philosophy while working on a farm for a year. Rober Pirsig wrote "*Zen and the Art of Motorcycle Maintenance*" only after he had explored for years the complex psychological relationship that develops when one takes apart and rebuilds an engine. These exemplary feats reaffirmed Brain's belief that a different approach was needed in education. Having taught in J Krishnamurti Educational Centre (Brockwood Park) for 14 years, Brain felt that any of the seemingly technical subjects such as Engineering and Architecture still did not help young people to learn to be practical and versatile in using, understanding and caring for materials. Explains Brian, "When one is in direct relationship with practical problems, one develops an objective and logical thought process".

At this school, there is ample scope for children in their formative years to learn how to use their hands in doing electrical, motor, mechanical, plumbing and other such disciplines. During woodwork, when the child is making something, be it a spoon or a small desk for the school, he discovers a strong sense of his or her own ability to create something in life.

Brian holds the conviction that a young person who has discovered that the Earth is beautiful will naturally feel responsible towards it. Once the child fells that responsibility, he or she will find out the practical solutions needed to care for nature's bounty. Certainly, it is this conviction in his children which motivates Brain to carry on his cause.

Source: *Down to Earth*, July 15, 2001.

Upto the age of thirty, poetry of many kinds gave me great pleasure, and even as a schoolboy I took intense delight in Shakespeare, especially in the historical plays. I have also said that formerly pictures gave me considerable, and music very great delight. But now for many years I cannot endure to read a line of poetry; I have tried lately to read Shakespeare, and found it so intolerably dull that it nauseated me. I have also lost almost any taste for pictures or music ....My mind seems to have become a kind of machine for grinding general laws out of large collections of fact, but why this should have caused the atrophy of that part of the brain alone, on which the higher tastes depend, I cannot conceive .... The loss of these tastes is a loss of happiness, and may possibly be injurious to the intellect, and more probably to the moral character, by enfeebling the emotional part of our nature.

— Charles Darwin, in his autobiography.

• Imagination is more important than knowledge.

-Einstein

• "The Exam process involves a one-way judgement system. The Authorities may talk of dialogue and feedback, and verbally encourage people to be critical, but the basic structure of the Exam discourages such critical approaches. When you read a book, you read with an academic ghost looking over your shoulder. Instead of thinking 'how does this fit into my ideas and experience?, you find yourself thinking 'how could this fit into the question on x ...? The Exam / assessment system...colonises all your thinking and experience."

EDUCATION ANALYSED - FOR COMPETITION OR CO-EVOLUTION ?

COMPETITIVE VALUES EMPHASISE	COMMUNITY VALUES EMPHASISE
1. Rank, division, marks, prestige	1. Doing the best you can with the gifts you have
2. Intelligence, appearance, social background	2. Character; respect for others and for nature
3. Getting ahead of others	3. Helping others so that all move ahead together
4. Studies before all else	4. Life and how to live
5. Examinations	5. Self-assessment and self-evaluation
6. Conformity to the norms set for those who wish to get ahead	6. Freedom to be creative and to initiate, to work with others
RESULT IN	**RESULT IN**
1. Parental and Social pressures leading to tension, competitiveness, cheating and lying	1. Relaxed atmosphere, in which really creative work can be done
2. Selfishness to get ahead	2. Community and group consciousness to work together for a common goal
3. Materialistic value judgement and acquisitive tendencies	3. Humane value judgements
4. Child's standing depends on her/his academic achievements, or on what s/he has	4. Child's standing depends on her/his personal value, or on what s/he is
FINALLY PRODUCE	**EVOLVE INTO**
1. An insecure person, who is dependent for her/his worth on factors outside her/his control	1. A person secure in the realisation of her/his own worth - whose value depends on her-/him-self
2. A person who will only function when s/he is rewarded	2. A person who works for the satisfaction of a job well done
3. A conformist since that is the best way to earn reward within the system	3. A person whose first loyalty is to her/his own values since the reward of the system has no meaning for her/him
4. A human being for whom to succeed is the most important thing	4. A human being for whom integrity is the most important thing
5. A person concerned primarily for her-/him-self	5. A person concerned for others

TO FIND OUT WHICH SIDE YOUR SCHOOL IS ON

Check:

a) The admission policy
b) The examination policy and the teachers' attitude to testing
c) The promotion policy
d) The daily system of rewards and punishments
e) The annual prize-giving–who get the best credits? And what for?
f) The class room atmosphere–the best disciplined classes are not always the most productive
g) **Above all, look at the children's faces: joyful, happy, content, or, wary, tense, anxious?**

— Sr. Cyril
Loreto - Sealdah, Calcutta

> Minds are like parachutes: they only function when open.
> — Thomas Robert Dewar

> Knowledge is not something to be packed away in some corner of our brain, but what enters into our being, colours our emotion, haunts our soul, and is as close to us as life itself.
> — Dr. S. Radhakrishnan

> A mind all logic is like a knife all blade. It makes the hand bleed that uses it.
> — Tagore

> A great many people think they are thinking when they are merely rearranging their prejudices.
> — William James

On Loreto School, Sealdah

I have visited Loreto, Sealdah on 3-4 occasions, and have spent about 5-6 hours in their school premises. Several observations at L.S. struck me as being markedly different from what one sees in other schools.

1. In the classes for younger children, I noted:
- The sitting arrangement is not in straight rows of benches. About 5-6 girls usually sit around a table, the common space they share.
- All available wall area is like a many-faceted 'wall magazine' with writings and drawings (or other visuals) on a number of subjects. Many activities are done in small groups, and education seems a truly participatory affair. Considerable learning takes place through observation, discussion and doing, instead of one-way instruction from teacher to student, which is commonly a funnelling of information (or prejudices)

2. In the gym, I saw eight silk screens with a number of girls (of different ages) messing around, printing posters on various social problems.
3. L.S. encourages (and makes possible) interaction with children in rural areas. There are many girls who take literacy classes in the village (once a week).
4. In the middle of Dec.'87, a number of girls from L.S. had a 3- day workshop at C.I.N.I., Poilan, together with some girls from local schools in or around the village.
   The broad focus was on how the environment (biological, physical or socio-cultural) affected their lives. Some of the themes covered were: trees, water resources, agricultural practices, pesticide problem, air pollution. After long discussions and joint consultations, the girls prepared several hundred posters covering various aspects. These posters (and mud models) were displayed on the last day of the workshop as an open exhibition where parents and others were also invited.
   It was most heartening to see the curricular fixation of schools (which is rampant) making some way to the concept of **"Life As School and Convivial Playground".**

— Bharat

On Libertarian Education

• "The educator who sees himself as the possessor of superior knowledge or skills which he 'passes on' to more or less willing disciples, whether this is in the name of liberal/ democratic outlook or a socialist/revolutionary analysis is part of an authoritarian, or at best, paternalistic culture.
The relationship between the libertarian 'educator' and 'student' will be a free, cooperative and increasingly ambiguous relationship based on the mutual investigation of problems (which does not mean the student finding answers to the teacher's questions). The essential element in this relationship is the open, whole-hearted respect which must exist between those involved and special care must be taken where young children are concerned that their natural trust is not abused, however well-meaningly, by those in the position of teacher. However clever the latter might be, the fact remains that he can only help his students to liberate themselves if he finds it possible to enter into a genuine dialogue with them, accepting their ideas and feelings as real and meaningful, however mistaken, examining and discussing such ideas and feelings rather than 'correcting' them."
"It seems to me that what we do in most schools (there are honourable exceptions), carries a message to children which says 'what you know, what you think, what you want, what you're afraid of, what you're concerned about, all of these things count for nothing. The only thing that counts is what we know, what we want, what we want you to do, what we want you to be.'We don't do this as villians, of course. But what a child knows, cares about and wants and wonders about and likes and dislikes - the sum of these things is the person. And when we deny, as we do in schools and conventional education, the validity of this person and his experience, we are doing something which seems to me to be performing a kind of spiritual lobotomy on children."
"Birds fly, fish swim, humans think and learn. Therefore we do not need to 'motivate'children into learning, by wheedling, bribing or bullying. We do not need to keep picking away at their minds to make sure they are learning."
"The learner, young or old, is the best judge of what he should learn next. In our struggle to make sense out of life, the things we most need to learn are the things we most want to learn. Curiosity is hardly ever idle. When we learn this way we learn both rapidly and permanently."

— John Holt.
(front 'Libertarian Education, issue no. 9, pg. 16, published by Libertarian Education Group, c/o Flag Bookshop, Wilne Street, Leicester, U. K)

Education (some references)

1) **Foundations of Living** by Marjorie Sykes, Pub : Parisar, pp 53, Rs. 15/-
(2) **The Aim of Life**, Pub : Sri Aurobindo International Institute for Educational Research, Auroville
(3) **The Underground and Education** by Mike Smith, Pub : Methuen
(4) **The Drama of the Gifted Child and the Search for the True Self** by Alice Miller. 152 pp £12.50. Pub : Faber and Faber
(5) **On Education** by Tolstoy, 360 pp. $2.95 Pub : University of Chicago Press
[Tolstoy documents his attempt to cultivate the free human spirit through education in his experimental school for peasant children)
(6) **The Story of Nai Talim** - Fifty years of education at Sevagram by Marjorie Sykes. 94 pp. Rs. 15/- Pub: Nai Talim Samiti.
[Author's experiences and reflections on Nai Talim]
(7) **Summerhill** by A.S. Neill 336 pp. £ 3.95 Pub: Penguin
[A.S. Neill's famous account of his philosophy and experience of teaching children at his school called 'Summerhill']
(8) **The Self-Respecting Child** by Alison Stallibrass. 272 pp. £ 3.50 Pub: Thames & Hudson
(9) **Magical Child Matures** by Joseph Chilton Pearce. 278 pp. $ 4.50 Pub: Bantam.
(10) **For the Children's Sake** by Caroline New and Miriam David. 379 pp. £ 4.95 Pub: Penguin

GENERAL ECOLOGICAL ISSUES

(Some References)

(1) **The State of India's Environment - The Second Citizens' Report** 1984 -'85, Rs. 85/- (P.B.) Pub : Centre for Science & Environment, 807, Vishal Bhawan, 95, Nehru Place, New Delhi 110 019 (an excellent, detailed study of the major environmental problems faced in India)
(2) **Gaia : An Atlas of Planet Management**, ed. by Dr. Norman Myers
[An outstanding book that looks at the world's environmental problems and the alternative strategies that need to be explored]
(3) **Who Speaks for Earth** ? ed. by Maurice F. Strong, 173 pp, $1.75 Pub : Norton
[Seven citizens of the world on major issues of the global environment - Barbara Ward, Rene Dubos, Thor Heyerdahl, Gunnar Myrdal, Carmen Miro, Lord Zuckerman, Aurelio Peccei]
(4) **Famine : A Man-Made Disaster? - A Report for the Independent Commission on International Humanitarian Issues**. $ 4.95 Pub: Vintage Books.
[How mistaken policy & inefficient management of natural resources have brought starvation in Africa]
(5) **Our Common Future - The report of the World Commission on Environment and Development**, 1987, chaired by Gro Harlem Brundtland, P.M. of Norway, 400 pp., £ 5.95, OUP
(6) **Progress for a Small Planet** by Barbara Ward, 305 pp, £ 2.50 Pub: Penguin Books
[In a masterly survey of possible policies, the author outlines the planetary bargain between the world's nations that would guarantee every citizen the right to freedom from poverty & also keep our shared biosphere in good working order]
(7) **The Reenchantment of the World** by Morris Berman, 366 pp., $ 4.95, Pub: Bantam Books
[A provocative look at Western life, it analyses the causes of our modern dilemma - a world on the brink of economic chaos, ecological disaster and personal disintegration. Drawing on philosophy, history, psychology and anthropology, the author traces the destructive distancing of man from nature back to the ideas of the Scientific Revolution and challenges the current supremacy of our own scientific thought.]
(8) **Green Politics** by Charlene Spretnak & Fritjof Capra, 262 pp. £ 3.95, Pub: Paladin Grafton Books
[Outlines, incisively and clearly, the problems and issues facing the German Greens, and shows their relevance to the wider world]
(9) **Gaia : A New Look at Life on Earth** by J.E. Lovelock, Pub: Oxford University Press
[presents the revolutionary 'Gaia Hypothesis' that looks at the earth as a whole, self-regulating organism]
(10) **Seeing Green** by Jonathon Porritt, 249 pp, Pub: Basil Blackwell.
[Speaking with a knowledgeable and engaging voice, the author presents a complete argument for the Green vision of life on earth. No one who reads this book will ever again confuse ecological politics with mere environmentalism]
(11) **The Seventh Enemy** by Ronald Higgins, 290 pp, £ 1.25, Pub: Pan
[Threatened on all sides by immense challenges over-population, food-crisis, resource shortage, environmental degradation, nuclear abuse & uncontrolled technology, the seventh and most important enemy we must face is perhaps the most frightening of all. That enemy is ourselves, our own individual blindness to the stark realities of the twentieth century]
(12) **How to Save the World** ed. by N. Albery & M. Kingley, 319 pp, £ 6.95 Pub: Turnstone Press.

[Brings together over 60 articles by a formidable array of alternative activists and philosophers, all of whom are concerned with the question of size and viability of global institutions, decentralisation and independence from the giantism of mass societies, whether ethnic, cultural, linguistic or religious. They consider a broad range of subjects including politics, ecology, economics, feminism, education, medicine, technology and agriculture]

(13) **Reclaim the Earth** ed. by L. Caldecott & S. Leland, 245 pp. £ 4.95 Pub: Women's Press Ltd 124, Shoreditch High Street, London - E16JE
[Brings together feminist writing on the threat to life on earth : on problems of militarism, nuclear weapons and nuclear power, on the politics of health, childbirth, technology and food]

(14) **Acid Rain** by Steve Elsworth £ 3.95, Pub: Soil Association, 86/88 Colston Street, Bristol - BS15 BB, U.K.

(15) **Blueprint for a Green Planet** by J. Seymour and H Girardet £ 6.95 Pub: Soil Association

(16) **Issues in Environmental Education in ASEAN** ed. by Arun Balasubramaniam, 138 pp, Rs. 55/- Pub: FNS/Singapore [Eight essays on the subject of environmental education, concept and practice, within individual ASEAN countries. Useful for educators and course designers]

(17) **Ecodevelopment - Towards a Philosophy of Environmental Education** by Arun Balasubramaniam 82 pp, Rs. 40/-.
[The way external diseconomies can be dealt with is not by adopting authoritarian controls but by changing the nature of modern technology so that it will embody ecological values. Such an ecotechnology requires a transformation in our attitudes towards Nature]

(18) **Humanity must Protect Nature** by Chee Yoke Ling 22 pp, Rs.10/-.
[What Islam, Taoism, Hinduism & Christianity have to say about environmental protection]

(19) **The Environmental Activists' Handbook**, ed. by Gayatri Singh & Madhusudan Rao, 253 pp, Rs. 75/- Pub: Asha Kendra.
[Vital compendium of information for environmental activists from the legal angle : includes the Environment Act, important judgements & strategies]

(20) **Environmental Crisis in Asia - Pacific**, 62 pp, Rs. 12/-
Pub: Sahabat Alam Malaysia
[Declarations and Resolutions of the SAM seminar on "Problems of Development, Environment and the Natural Resource Crisis in Asia - Pacific"]

(21) **Rethinking Development - In Search of Humane Alternatives** by Rajni Kothari, 233 pp, Rs. 200/-
[In this volume, the political scientist, who was also one of the early initiators of the alternatives movement, brings together all his writings on the subject]

(22) **The Impact of Environmental Degradation on People** by Viegas & Menon, 81 pp, Rs. 25/- Pub: ISI
[Reviews India's environmental situation in its entirety, and assesses the impact or cost of ecological deterioration on the lives of ordinary people]

(23) **Staying Alive** by Vandana Shiva, 224 pp, Rs. 125/--Pub: Kali for Women
[This book about development, ecology and gender argues that there is an intimate link between the degradation of women & the degradation of nature]

(24) **Papers on Rural Development & Rural Poverty**, ed. by
Nandita Ray, 156 pp, Rs. 80/- (P.B.), Rs. 150/- (H.B.) Pub: YIP
[A number of essays written by activists of the Young India Project, Anantpur, on development. Distilled wisdom of people involved over a long period of time (1980-'86) in rural transformative work]

(25) **Earth's Aura** by Louise B. Young, Pub: Knopf

(26) **The Atmosphere** ed. by Margaret Mead and William W. Kellogg. Pub: Castle House Palms Ltd.

(27) **Algeny** by Jeremy Rifkin. $ 14.75
[A Critique of the coming era of bio-engineering, and a critical examination of the way we view our relationship with nature]

(28) **Limits to Growth - A Report for the Club of Rome's project on the Predicament of Mankind**, $ 3.95 Pub: Signet Books

(29) **Mind & Nature** by Gregory Bateson, $ 8.50 Pub: Bantam Books
[Reveals 'patterns which connect' man and nature and shows how we can preserve ourselves and our planet]

(30) **Who Owns the Earth?** by James Ridgeway, 151 pp, $8.95 Pub: Collier Books
[A look at all the earth's natural resources, where they can be found, what they're used for, how valuable they are, how much is left, and, finally, who controls them]

(31) **Notes for the Future - An** alternative history of the past decade, ed. Robin Clarke, 230 pp, £ 6.00 Pub: Thames & Hudson
[This anthology brings together much of the best committed writing of the seventies - a decade which saw concern for the environment become a political issue, severe criticisms made of the science & technology practised in the West, and a new search for the real meaning of human community]

(32) **Economic Development of a Small Planet** by Benjamin Higgins & Jean Downing Higgins, 292 pp. $ 14.95 Pub: Norton

(33) **Development & Environmental Crisis**, by Micheal Reddiff, $ 4.75, Pub. Vintage Books
[Red or Green alternatives?]

ECO-LOGIC REFERENCE GUIDE

(A guide to the listed books in the articles and a sample of recent books available for reference from DRCSC Library)

I. General Ecological Issues

1) The State of India's Environment
2) Gaia : An Atlas of Planet Management
3) Who Speaks for Earth?
4) Famine : A Man-made Disaster?
5) Progress for a Small Planet
6) The Re-enchantment of the World
7) Green Politics
8) Seeing Green
9) The Seventh Enemy
10) How to Save the World
11) Reclaim the Earth
12) Blueprint for a Green Planet
13) Acid Rain
14) Issues in Environmental Education in ASEAN
15) Ecodevelopment : Towards a Philosophy of Environmental Education
16) Humanity must Protect Nature
17) The Environmental Activists' Handbook
18) Environmental Crisis in Asia-Pacific
19) Rethinking Development
20) The Impact of Environmental Degradation on People
21) Staying Alive
22) Papers on Rural Development & Rural Poverty
23) Algeny
24) Limits to Growth
25) Who Owns the Earth ?
26) Notes for the Future
27) Economic Development of a Small Planet
28) Development & Environmental Crisis

I

Theoretical introduction:

English:

- **Ecorestoration: concepts and procedures,** *Sathis Chandran Nair*
- **Ecology For Beginners,** *Croall, Stephen & Rankin, William*
- **Ecological Uncertainty, Institutions and Myths,** Vasant K. Saberwal, *Seminar*
- **Best Practices : Environment,** *The Economic Intellegence Unit (EIU)*
- **Environment and Development,** *Ashish, Ghosh*
- **Environmental Pollution and Individual Man,** *De, Amit Krishna (ed)*
- **Environmental Biology,** *Trivedi, P.R & Raj, Gurdeep*
- **Hot Topics: Everyday Environmental Concerns,** *Abbasi, P. Krishnakumari & F Khan*
- **Household Environment and Health,** *Atiqur, Rahman*
- **Environmental Consciousness & Urban Planning,** *M N Buch*
- **Environmental Pollution,** *N Manivasakam*
- **The Impact of Environmental Degradation on People,** *Philip Viegas and Geeta Menon.*

Bengali:

- **Upkaran Samikha (Resource Studies),** *Kuntala, Lahiri Dutta*
- **Paribesh Prasanga,** *Tarak Mohan, Das & Subhash Ch. Snatra*
- **Paribesh-O-Dushan (Environment & Pollution),** *Goutam, Paul*
- **Prakriti Paribesh O Dushan,** *Biswajit, Dutta*
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Before these fields were shorn and tilled,
Full to the brim our rivers flowed;
The melody of waters filled
The fresh and boundless wood,
And torrents dashed, and rivulets
played,
And fountains spouted in the shade.

– Bryant

ECOLOGICAL AGRICULTURE

Modern chemical agriculture is like the light of a match, Flickering brightly for a moment in time, quickly burning itself out.....

.....The sun is now rising on a new type of agriculture - an agriculture that is more productive and efficient than traditional agriculture, while overcoming the drawbacks of modern agriculture.

◇ Would it not be well to consult Nature, for she is the most experienced planter of us all ?

— Thoreau

What's Organic ?

(A survey of various agricultural methods which treat the soil as a living, organic medium, and which avoid using chemical fertilisers. These include natural farming, the bio- dynamic approach, permaculture and other methods aimed at an ecological and sustainable agriculture.)

At the outset, I'd like to clarify that the term 'organic agriculture' is being used here in a broad sense; the main criterion is not whether organic manure is used but whether soil is considered and treated as a living (i.e. organic) medium. Organic farmers give precedence to soil protection and regeneration over all else. The yield steadily improves as the soil regains its health.

Every organic farming method therefore focuses on building healthy, living soil. The differences in approach are partly due to the specific socio-economic and natural environment within which they developed and partly due to the cultural-philosophical framework underlying the method. Here, I present briefly an outline of the various organic methods I am aware of. I would welcome further information, opinion and ideas regarding methods not well described or not included at all.

The use of compost rather than organic manures was one of the earliest methods followed in organic farming. There are, however, differences of opinion on how compost should be made (i.e. what ingredients should and should not be used, and in what proportion they should be mixed,etc.); and how compost should be used (i.e. when it's ready? how much to use, etc.). Some of the prominent personalities who have done original work in this field are J.I. Rodale, author of "*Pay Dirt*"and Albert Howard, author of "*An Agricultural Testament*". Rudolf Steiner of Germany developed bio-dynamic sprays to be used to make compost and for direct field application (see '*Agriculture: A Course of Eight Lectures*' by Rudolf Steiner). The French Bio-dynamic method was a simplified version of Steiner's method. Later, this method was experimented with and documented by Ecology Action of USA. John Jeavons has explained the bio-dynamic way of making compost in his book '*How to Grow More Vegetables*'.

In the Bio-dynamic method, compost is seen as a soil building element and not primarily as a nutrient supplier. Similar ideas are now propagated by a Japan-based organisation known as MOA (after the name of the founder, M. Okada). They use composts made mainly of plant material and residues (sometimes a small quantity of chicken manure is used as a starter). The French bio-dynamic method is a bio-intensive method suitable mainly for kitchen garden and backyard farming. It needs large amounts of compost and regular supervision but uses less water and can produce more per unit area without affecting negatively the soil fertility.

French Bio-dynamic farming also took the idea of planting according to moon phase from the original Bio-dynamic method. Here I should point out that Steiner's idea of Bio-dynamic farming was not just another way of compost making but another way of looking at farming as a whole. The farm was seen as an organism and integration of various elements were carefully experimented with. (For a detailed explanation, you may consult "*Bio-dynamic Agriculture*" by Koepf and others.)

From the 1960's, the concept of conservation tillage and no tillage farming became popular in many parts of the world; various methods of mulch farming being a subcomponent of these methods. The Japanese farmer- philosopher Masanobu Fukuoka's work in this area is now well known and his book "*The Natural way of Farming*" has inspired many agricultural workers. For growing grain crops, Fukuoka uses a leguminous ground cover of white clover and also mulches the fields with the threshed straw of harvested crops.

ITTA, Ibadan, Nigeria has done pioneering work in the area of Alley Cropping: crops are grown in alleys formed by leguminous trees, the branches of which are periodically trimmed and incorporated into soil as green manure or used as mulch.

The sheet mulching technique developed by 'Permaculture', Australia, is also worth mentioning as it makes possible the growing of vegetables in poor soils or in an urban environment i.e. on a pavement or a rooftop. The use of cover crops or living mulch (e.g. growing corn with lobia or soyabean as a ground cover) has also been experimented on. This strategy has been extensively applied in Fukuoka's method of Natural Farming and in various agroforestry methods.

Integration of trees into cropping systems is a theme on which also much work has been done, and '*Permaculture: A Designer's Manual*' by Bill Mollison provides a wealth of information and ideas. It deals extensively with principles of designing and developing a farm, with careful attention paid to the

relative positioning of species in different zones. The aim of permaculture design is to develop self-supporting eco-systems for human needs.

Recent organic farming research has been concerned with the reduction of external inputs and recycling of waste to improve the energy efficiency of farms. Biological control of pests and weeds, and various possibilities of Bio Fertilizers are also being worked on in many countries. The planned use of earthworms is yet another area experimented with.

A combination of various strategies, i.e. diversifying crops through intercropping; integration of trees, animals, birds, insects and aquatic life into cropping systems; non use of any synthetic chemicals and use of biological control methods is collectively known today as Ecological Agriculture. In addition to the Permaculture Manual, much work in this field has also been documented by M. A. Altieri. (Ref : '*Agroecology: the scientific basis of alternative agriculture*'.)

Another initiative worth mentioning is by the International Institute of Biological Husbandry (Founded 1975). They also see soil primarily as biological (organic) rather than a chemical medium. (For more details, ref. '*Biological Husbandry*' by B. Stonehouse.)

In future, we may discuss seperately each school of thought and what work is currently going on, if that is felt necessary by you, who read this. So please react !

-Ardhendu S. Chatterjee

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   [A wide range of vegetables, herbs and fruits is included - accompanied by colour photographs and step-by-step guide to each stage of planting, cultivation, harvesting and storage.]
10. Tropical Legumes : Resources for the Future. Pub: National Academy of Sciences. Washington D.C.
11. Tree Crops: A Permanent Agriculture by J.Russel Smith. Pub: Devine - Adair.
12. FertilityPastures & Cover Crops by Newman Turner. Pub: Bargyla & Gylver.
13. The Agricultural Crisis: A Crisis of Culture, by Wendell Berry. £ 1.35. Pub: Soil Association.
14. Biodynamic Composting on the Farm, by E. Pfeiffer, £ 2.75. Pub: Soil Association.
15. Biodynamics by E. E. Pfeiffer £ 1.70. Pub: Soil Association.

(contd. on p. 129)

PERMACULTURE

A Designer's Manual
By Bill Mollison

This book is about designing sustainable human settlements, and preserving and extending natural systems. It covers aspects of designing and maintaining a cultivated ecology in any climate: the principles of design; design methods; understanding patterns in nature; climatic factors; water; soils; earthworks; techniques and strategies in the different climatic types; aquaculture; and the social, legal, and economic design of human settlements.

Permaculture (permanent agriculture) is the conscious design and maintenance of agriculturally productive ecosystems which have the diversity, stability, and resilience of natural ecosystems. It is the harmonious integration of landscape and people providing their food, energy shelter, and other material and non- material needs in a sustainable way. Without permanent agriculture there is no possibility of a stable social order.

The philosophy behind permaculture is one of working with, rather than against, nature; of protracted and thoughtful observation rather than protracted and thoughtless action; of looking at systems in all their functions, rather than asking only one yield of them; and of allowing systems to demonstrate their own evolutions.

The world can no longer sustain the damage caused on by modern agriculture, monocultural forestry, and thoughtless settlement design, and in the near future, we will see the end of wasted energy, or the end of civilization as we know it, due to human-caused pollution and climate changes. Strategies for the necessary changes in social investment policy, politics itself, and towards regional or village self-reliance are now desperately needed, and examples of these strategies are given. It is hoped that this manual will open the global debate that must never end, and so give a guide to the form of a future in which our children have at least a chance of a reasonable existence.

Code EA-1
"Soil & Water Management"

The Council for Advancement of People's Action and Rural Technology (CAPART), has undertaken a project for the compilation of a National Directory on Rural Technologies. The latest publication in the series, "Soil and Water Management" is now available. This contains information on soil sampling, fertility and cultivation; soil conservation, erosion control and reclamation, water conservation, water resources, lifting and distribution, irrigation and drainage and soil and water testing. Available against an advance payment of Rs. 100/- (in 1989) payable by Demand Draft, drawn in favour of CAPART, Guru Nanak Foundation Building, New Mehrauli Road, New Delhi - 110 067

16. The Long Way Ahead -New Concepts of Agriculture £ 0.75. Pub: Soil Association.
17. What is Biodynamic Agriculture ? by H. H. Koepf. £2.20. Pub-. Soil Association.
18. Successful Organic Gardening by Geoff Hamilton. £I4.95. Pub: Soil Association .
19. Rice In Abundance for All Times by Dr. R. H. Richharia. 132 pp. Rs. 65/-.
    [In this book, the eminent rice scientist offers a practical guide for enhancing the production of rice, using local Indian varieties.]
20. The Greening of Wastelands ed. Hegde & Abhyankar. 204 pp. Rs. 60/-., Pub: BAIF
    [Proceedings & papers of the national workshop on utilisation of wastelands for bio-energy held at Pune in 1985]
21. Handbook of Wastelands Development by N. G. Hegde. 128 pp. Rs. 30/-. Pub: BAIF.
    [The handbook provides information on practical, inexpensive & maintaining highly effectivce cultivation techniques for establishing and maintaining tree plantations on different types of wastelands]
22. Agroforestry : Selected Readings, ed. Hegde & Kelkar. 98pp. Rs. 36/- Pub: BAIF
    [7 essays on the subject of agroforestry, techniques, economic analysis, etc.]
23. A Small Experiment on Ecodevelopment through Low-Energy Natural Farming. 41 pp. Rs. 20/- Pub: Gandhi Peace Foundation.
    [This is the first interim report of the application of the Fukuoka method of natural farming in Mohanpur]
24. The Mohanpur Experiment In Natural Farming by T. S Ananthu & Others. 30 pp. Rs.15/-Pub: GPF
    [This is the second interim report of the application of the Fukuoka method of natural farming in Mohanpur]
25. Rice & Rice Varieties, 41 pp. Rs. 10/- Pub: Samvardhan
26. Organic Farming. 60 pp. Rs.10/- Pub: Samvardhan
27. Indigeneous Tree Species (Forthcoming), Rs.10/-, Pub: Samvardhan
28. Indigeneous Oil Seeds(Forthcoming), Rs.10/-Pub : Samvardhan
29. Planting & Aftercare of Fruit Trees by G.G.Sohani.10pp. Rs. 5/- Pub: BAIF.
    [A training aid for workers involved in afforestation of wastelands. Basically about techniques for planting and looking after trees.]
30. Indigeneous Agricultural Revolution by Paul Richards. 192 pp. Pub: Hutchinson.
31. Community Seed Bank Kit. Pub : Rural Advancement Fund International, R.R.I. (Beresford), Brandow, Manitoba, Canada - R7A5YI.
32. Agro-ecology : The Scientific Basis of Alternative Agriculture, by Miguel A. Altieri. 236 pp. Pub: Intermediate Technology Development. 9, King Street, London - WCZE8HW, U.K.
    [By combining traditional farming knowledge and modern agroecological principles, this book offers an integrated approach for designing systems with effective soil conservation features, nutrient-restoring capabilities, and built in biological pest control mechanisms. It also describes methods for developing technologies to meet the needs, ecological and socio-economic circumstances of low-resource farmers.]
33. Natural Crop Protection In the Tropics by Gaby Stoll. 1287 pp. Pub: AGRECOL, c/o Obozentrum, CH-4438, Langenbruck, Switzerland.
34. Two Ears of Corn - A Guide to People-centered Agricultural Improvement, by Roland Bunch. 248 pp. Pub: World Neighbours, 5116, North Portland, Oklahoma City, Oklahoma - 73112.
35. Natural Agriculture In the Tropics by Dr. Mrinal Kanti Mitra. Rs. 50/- Pub: Author, AA/8, Deshbandhu Nagar. Baguiati, Calcutta - 700059.
    [A report of experimentation done according to Fukuoka's method of natural farming at Choto Simulia, Bolepur (near Shantiniketan) West Bengal, - a project of the Tagore Society for Rural Development.]
36. Forest Farm Husbandry by Matthew Fedden.70pp. Pub: TCC, Ghana.
    [Based on experiences at Ghana's Technology Consultancy Centre, this handbook describes successful methods of minimum tillage farming and alley cropping. The book suggests that alley cropping offers great promise as a soil conserving and enriching technique that also affords good weed control. Useful for forest zone farmers in all parts of the humid tropics.]
37. Biological Methods of Pest Control K. Vijayalakshmi ed., 100 pp, Rs. 35/-, Pub: PPST.
    [Proceedings and papers of a seminar organised by the PPST on natural farming and traditional and biological methods of pest control.]
38. Breaking the Pesticide Habit by Terry Gips. 374 pp. Pub: International Alliance for Sustainable Agriculture.
39. Natural Pesticides from the Neem Tree and others Tropical Plants. Pub: GTZ, Gmb H, Dag Hammerskjold - Weg 1&2, D 6236, Eschborn - 1. Federal Republic of Germany.
40. Organic Plant Protection Roger B. Yepsen ed. 688 pp. Pub : Rodale Press, Emmans, Pennsylvania - 18049, U.S.A.
41. Soil & Water Management Pub: CAPART
    [2nd volume in the Directory of Rural Technologies.]
42. Appropriate Technology Sourcebook, Ken Darrow & Mike Soxenian ed. 800 pp, Pub: VITA
    (contains details of over 1,1 50 books on appropriate technologies.)
43. Companion Planting by Philbrick and Gregg.
44. Carrots Love Tomatoes by Louis Riolte, Pub: Garden Ways Press.
    [Also on companion planting]

Biological Pest Control

United Nations statistics say that 2 million people get poisoned by pesticides each year, 400,000 die. Most of the victims are in the third world. Resistant species of insect pests have risen from 10 to 432 between 1954 to 1980. 35% of crops will be destroyed if no control measures are taken.

With the introduction of high yielding varieties came a package of pesticide spray schedules and high inputs of nitrogen, phosphorous and potash. Pesticides succeeded in eliminating susceptible pests and also beneficial insects. But the result of such pesticide sprays also became the basis of breeding hardier and more venomous strains of pests that were resistant to the pesticide. One example of how the insect pest develops resistance is seen in the chilli yellow mite (Polyhagotarsonemus lactus) for which the pesticides Fenvalerate, Permethrin, Decamethrin, Acephate are not only now ineffective, but aid its population build up by their application. When these resistant pests become a problem, the farmer resorts to heavier and stronger doses of pesticides out of sheer desperation. This can, in turn, result in new types of pests due to mutation. Aphids are now known to produce an enzyme which effectively breaks down the pesticide to harmless forms.

With more and more pesticide applications, all that you get is more contaminated fruits and vegetables. Direct poisoning occurs to all living things, causing severe health hazards. Most of all, there is total imbalance in nature as most of these pesticides kill the natural enemies of the pests. We must now take measures to conserve and augment the population of the natural enemies.

Attracting Natural Enemies

In attracting & conserving natural enemies of pests, we must provide them alternative hosts or vegetation as suitable habitat or food.

Example: Aphids (Aphis gossyphi) is a pest of various cultivated crops (cotton, ladyfingers, citrus etc.). The other host plants for this pests are Rumex nepalensis, Sechium edule, nasturtium and many more. The natural enemies of the pests are Trioxys indicus as parasite, and the Ladybird beetle and larvae Coccinella septempunctata as predators. The host plants will ensure a food source and habitat for the natural enemy populations which will then control the pest when it attacks the cultivated crop by homing in from the alternate host plants.

Two-spotted ladybird

Oleander near citrus orchards will ensure continuous supply of natural enemies of the scale insect, as the scale will breed on the oleander under humid conditions

It is advisable to grow plants (trees, herbs and shrubs) which are alternate hosts for pests along fence lines and in between cultivated crops. Mixing crop plants with different varieties of the same species also helps in maintaining the population balance and reduces disease problems. Flowering shrubs and trees throughout the garden or farm will attract many beneficial insects including parasitic wasps which require pollen and nectar for their growth and maturity. Choose these plants to suit local conditions and select different species of flowering plants so that you will have flowers in the garden blooming all the year round.

SOME IMPORTANT NATURAL ENEMIES :-

Preying mantis *- it feeds on all types of insects (nocturnal) especially aphids and mosquito.*

Dragonfly *nymphs and adults feed on insects. Dragonfly nymphs live in water.*

Damselfly *- same as above.*

Assassin bug*-feeds on insects*

Lacewings *- feeds on aphids and soft bodied insects.*

Ant lion*-feeds on ants.*

Ground beetles*-feeds on other insects, hunts during the nights.*

Whirligig beetles*-adult and larvae feed on other insects. They live in water.*

Rove beetles, Tiger beetles, White banded clerid, Green carabid beetle, Robber flies*-all feed on other insects.* ***Ladybird beetles*** *- feed on scales and aphids.*

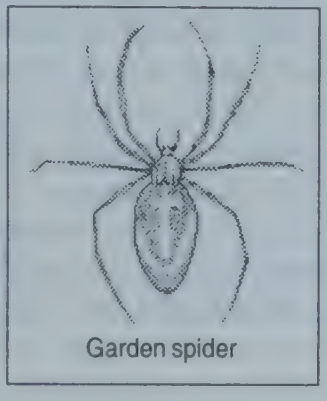
Tachinid flies, Braconid wasps*-live on other insect pests by completing their life cycle on these pests. They usually attack the egg of the host pest or directly attack the caterpillars and lay an egg into the body. The larva of the natural enemy hatching inside the caterpillar body feeds on the host body.*

Nesting sites for Rove beetles, carabid beetles include logs of dead trees, irregular shaped rocks with crevices and cavities and plenty of mulch, which can be placed under trees scattered throughout the farm and garden. These beetles which feed on other insects are usually found under moist, decaying, animal or vegetable matter. Creating such nesting sites will also provide homes for lizards and snakes.

The role of the lizards and the snakes is well known in the control of insects. They are essentially carnivorous and therefore feed only on insects and small animal life.

Provide structures for nesting birds by growing evergreen shrubs and trees with dense foliage. Other bird attractants are fruiting trees of the jungle variety (Local native spp.). Provide well-spaced stakes throughout the crop as bird perches. These bird perches will serve as good vantage points for the birds to sit and then descend on the insect pest like the caterpillars for its meal. Most birds can collect insects as feed for their young. This feed you can provide from your crop plants by encouraging the birds to visit your garden.

A living fence of different shrubs (evergreen and flowering) planted as hedgerows or windbreaks along fence lines will not only reinforce the barrier against intruding mammals but aids in the build-up of natural enemies of insect pests. Research reports have pointed out that there is an increase in pest density when a hedgerow (living fence) is replaced by a wire fence.


Garden spider

Well vegetated small dams, little water pools, swales scattered throughout the farm will create conditions for the build up of natural enemies. Many predatory insects live in, on and near water. The role of frogs as good insect feeders is well known. From these water holes, the frogs will forage for insects in your garden and get rid of a variety of insect pests. The other benefits of water holes is that it provides much needed humidity for the survival of natural enemies and as a source of drinking water for reptiles, birds and frogs. Feed for fish stocked in dams can be supplemented by insect traps.

Cultural Practices

While harvesting a crop, harvest only what is good or healthy. Leave the pest-affected produce in the field. This practice will aid in the build up of the natural enemies of that pest. Cultivation (tilling) in the farm or orchard could destroy some natural enemies and has been shown to increase populations of many pests including plague locusts. For example when weeds are destroyed in apple orchards, there will be a reduction of the natural enemy of the codling moth. Cultivation in orchards will result in the reduction of the natural enemy complex of the pest woolly aphid.

Reduce dust build up in crop plants by growing ground cover crops like clover, vetch, cowpea, etc. Use of overhead sprinklers will help periodically in washing off the dust from the crop plants, as dust inhibits the functioning of natural enemies. Well designed wind breaks will reduce dust, especially when species such as honey locust are planted.

Humidity is important for the health of many natural enemies. For most crops, adequate moisture level is enough for optimum activity. Flood irrigation destroys the natural enemies of the cabbage diamond moth (Plutella xylostella). Growing mixed crops and harvesting them in strips also helps maintain natural enemies and confuses pests. For fungal pathogens (wilt) the practice of mixed cropping is desirable as the root exudates of another crop can be toxic to the pathogen, or it encourages soil microbes which in turn act as barriers to the fungal pathogen.

-John Prakash Pereira

(John Prakash Pereira is a Permaculture consultant from South India, who has been researching for a handbook on ecological pest management in Permaculture design. The above article was published in the International Permaculture Journal, Issue No.30, 1988.)

The Golden Rule of Pest Control

"Grow sturdy crops in a healthy (balanced), natural environment." This is the simple, golden rule that Fukuoka prescribes for controlling pests so that they never become a problem. In Fukuoka's natural farm, insects are present, but crops are never devastated. Any damage affects only the weakest plants, and sometimes a larger total yield results. This is because with the weak plants consumed by insects, there is less competition for sunlight, nutrients and space to grow in. Consequently, the surviving, healthy plants grow even stronger & provide more yield.

Some 'Don'ts'

1. Avoid spray chemical pesticides. These may seem effective in the short run, but cause enormous problems - poisoning the food cycle, indiscriminately wiping out beneficial organisms & predator species, breeding resistant strains that are more venomous,.....
2. Avoid monocultures. In such a disbalanced environment, the pests that feed on the particular crop you are growing have a field day. Mixed cropping is far better.

If you already have a pest problem, prefer :

1. Biological pest control that encourages natural enemies (predator species of pests)
2. Non-toxic control measures, e.g. Neem.

NEEM

TREE EXTRORDINAIRE

Azadirachta indica

The Neem Tree (Azadirachta indica) occurs over a wide range of climatic regions throughout India, Bangladesh, Sri Lanka, Sahel countries, Somalia, Botswana, Burundi, Angola, Haiti and North East Brazil. A close relative, White Cedar (Melia azedarach) is a native to Australia and South East Asia.

The tree is amazingly adaptable, tolerating very poor soils and rainfalls ranging from 250 to 2000 mm (10-80")per annum. The major restriction to cultivation is frost which it cannot tolerate. It is highly drought resistant, makes few demands on the soil, enriches poor soils, regulates soil humidity there-by moderating microclimatic conditions. It is suitable for shelter belts, retaining its leaves for a long time and provides a vertical fire-break by discouraging undergrowth. Although easy to cultivate, it doesn't appear to have potential to become invasive as it will not spread or develop easily in the wild. Surprisingly no naturally occuring stands have been found.

Another ecologically friendly aspect of Neem cultivation is the tree's refusal to perform well as a monoculture. Large scale monoculture trials in Africa and India have faced dismal failure. Better results were obtained in mixed forestry situations with Tamarix acaphylla, Casurina equistefolia, Eucalyptus camaldulensis, Bovelia papyrifera and Tespesia spp.. Agroforestry plantings with fruit and fodder crops especially Pennisetum pendicelatum and in inclusion in multi species shelter belts and windbreaks have been successful.

The vigorous, wide spread surface root system is useful in erosion control, and along dirt roads has improved traffic conditions after heavy rains. Standing alone it is a beautiful shade tree and in urban areas has the benefit of pollution tolerance. The surface roots have, however, posed no problem in intercropping systems with sesame, cotton, hemp, peanuts, beans, sorghum and Acacia arabica.

PRODUCTS FROM NEEM

1. OIL

The oil extracted from Neem seeds is used in the manufacture of soaps, lubricants and waxes and is probably the most important single commodity the plant offers.

2. ENERGY

The Neem tree produces an excellent firewood and charcoal. The fruit residues from oil extraction can be used to produce methane and its potential as a carbohydrate rich base for other kinds of industrial fermentation have yet to be researched. The oil is used for burning lamps.

3. MANURES

80% of the seed remains as residue after oil extraction. This is called "Neem Cake". It is an excellent fertilizer containing 3-5% Nitrogen, 2% Potash, 1-2% Phosphorus and 1% each of Calcium, Magnesium and Sulphur. The residual fats and odoriferous substances in the cake reduce the loss of nitrogen in the form of soluble NO_3 ions as they inhibit the growth of nitrifying bacteria. As a fertiliser and nitrogen conserver it has the additional benefit of repelling white ants and nematodes in the soil.

Some plants have been found to be incomparable with Neem mulch and its insectidal properties do have a significant influence on micro-fauna, fungi and bacterial communities. In compost it repells worms, insects and some bacteria, so should be used selectively. In hot countries where decomposition processes are frequently too rapid, it could have potential to slow the composting process down.

4. FODDER

The cake is commonly fed to cattle and is best processed as a granular meal. The leaves have a high protein content (15%) but due to bitter ingredients are only eaten by goats. The berries are poisonous to pigs but are fed to goats in Botswana.

5. PHARMACEUTICAL RESEARCH

The Neem possesses many medicinal properties including anti-diabetic, anti-bacterial and anti-viral, expelling stomach worms and taken as a cure for stomach ulcers. It is commonly used as a dentrifice in toothpaste and in India fresh twigs are frayed and used as a tooth-brush.

The ointment is used for skin disorders and the Neem soap possesses healing properties as well as containing antiseptic qualities.

6. INSECTICIDAL

The insecticidal properties of Neem seed extracts have long been known and are receiving more serious attention in recent years. Azadirachtin, one of the 8-10 active insecticidal chemicals in the Neem tree has been claimed to be the world's most powerful insect repellant.

Most of the recent attention has been promoted by GTZ, a German aid agency which has held several international Neem Conferences.

In the U.S.A. much research is underway and now a neem spray has been registered and cleared by the E.P.A. for use against 131 common insects. The product markets for approximately $30 per liter from Vikwood Botanicals, Sheboygan, Wisconsin 53082, U.S.A.

In Australia this year, the University of Queensland hosted a conference aimed at founding the establishment of an Australian Neem industry. Further information can be obtained from Martin Rice and Jean Erbacher, C/o. Dept of Entomology, University of Queensland, St Lucia 4067,Australia.

The plant has the potential of revolutionising the world pesticide industry. The complex molecule of azadirachtin cannot be artificially synthesised in the laboratory and in the field proves too complex for its pests to develop resistance. Research has yet to find any harmful or poisonous effects on humans and animals, and in the environment it is non-polluting. When applied to crops it has a systemic action being absorbed by plant tissue to offer durable protection even after heavy rain.

The simple preparation of an aqueous suspension of crushed kernels acts as an antifeedant and repellent and should an insect venture beyond its distasteful repellent barrier and eat the crop, it disturbs their hormone balance incapacitating their ability to defend themselves and breed.

The specific mode of action is that it has the same spectrum of action as malathion, preventing ecdysis (casting off the 'skin'- external skeleton or pupal case) in larval, pupal and adult insect form. e.g. it prevents plague locust changing from one instar (juvenile adult form) to the next.

The leaves also have insecticidal potential against mosquitos and is mixed in stored grains and seed against weevils and moths. (see box) Dried leaves kept in books protects them against insect damage by silverfish, moths, and lice. The odour of the burning leaves kills insects and is a useful fumigation technique for controlling household pests such as fleas, lice, bedbugs and cockroaches. Fresh leaves mixed into the soil reduces root rot and nematodes. The powdered leaves of Melia (White Cedar) can be dusted on brassicas to repel the white cabbage butterfly.

7. TIMBER

The wood of the Neem grows fast but has limited use, mainly due to its unpleasant odour. Even as a fuel it is only suitable for outdoor burning as its fumes are intolerable (For indoor combustion, charcoal is more suitable) The timber is good for agricultural implements and is termite resistant, making excellent fence posts and pole foundations. The odour renders it unuseable for furniture and indoor structures.

8. OTHER PRODUCTS

Pyrolysis processing can produce a high yield of charcoal and tar oil, the later containing good insecticidal properties for non-toxic wood preservation and treatment. It gives an average yield of acetic acid and methanol. The gas, cleaned with a sawdust filter, can be stored in tanks as a power source. Trials have yielded 1250 kilowatts from 1 tonne of matter.

Drumstick Tree

(Moringa oleifera)

* Water purifier
* Versatile food source
* Nitrogen fixer
* Fuel and fibre plant

The wide range of useful properties of Moringa are beginning to demand attention as an important domestic and commercial crop in the tropics. Micheal Benge, an agroforestry expert working with U.S. AID has been researching its uses and potential.

Moringa grows well in semi-arid zones and on marginal soils, as well as high rainfall areas and fertile soils. A legume, it fixes nitrogen, and can also improve the nutritional status of a population while providing seeds for water treatment. This makes the growing of Moringa a low-cost technology for rural communities in tropical developing countries.

Almost every part of the Moringa is useful in some way:

Root

Sometimes called Horseradish tree, the roots can be used as a horseradish substitute, eaten as a vegetable or pickled.

Leaves

The foliage is a ready source of vitamins A and C as well as calcium, phosphorus and protein. They can be eaten as greens in salads, curries and pickles.

Flowers

The flowers bloom continuously throughout the year providing a honey source for bees and are a good vegetable and pickle.

Pods

The pods cooked and curried like okra, are used throughout India, Burma and the Phillipines.

Seeds

Young seeds are used as a vegetable; mature seeds can be roasted and eaten like peanuts. A fine non-drying edible oil is extracted from the seeds; used for salads, and apart from the kitchen, for lubricating delicate machinery, watches, and used by artists.

The seeds are used for clarifying water, containing compounds similar to the conventional coagulant, alum. The powdered suspension added to the surface of turbid water will bring it to the clarity of tap water within one or two hours. It not only flocculates and precipitates sediment to the bottom of the water, it also carries up to 99% of indicator bacteria with it.

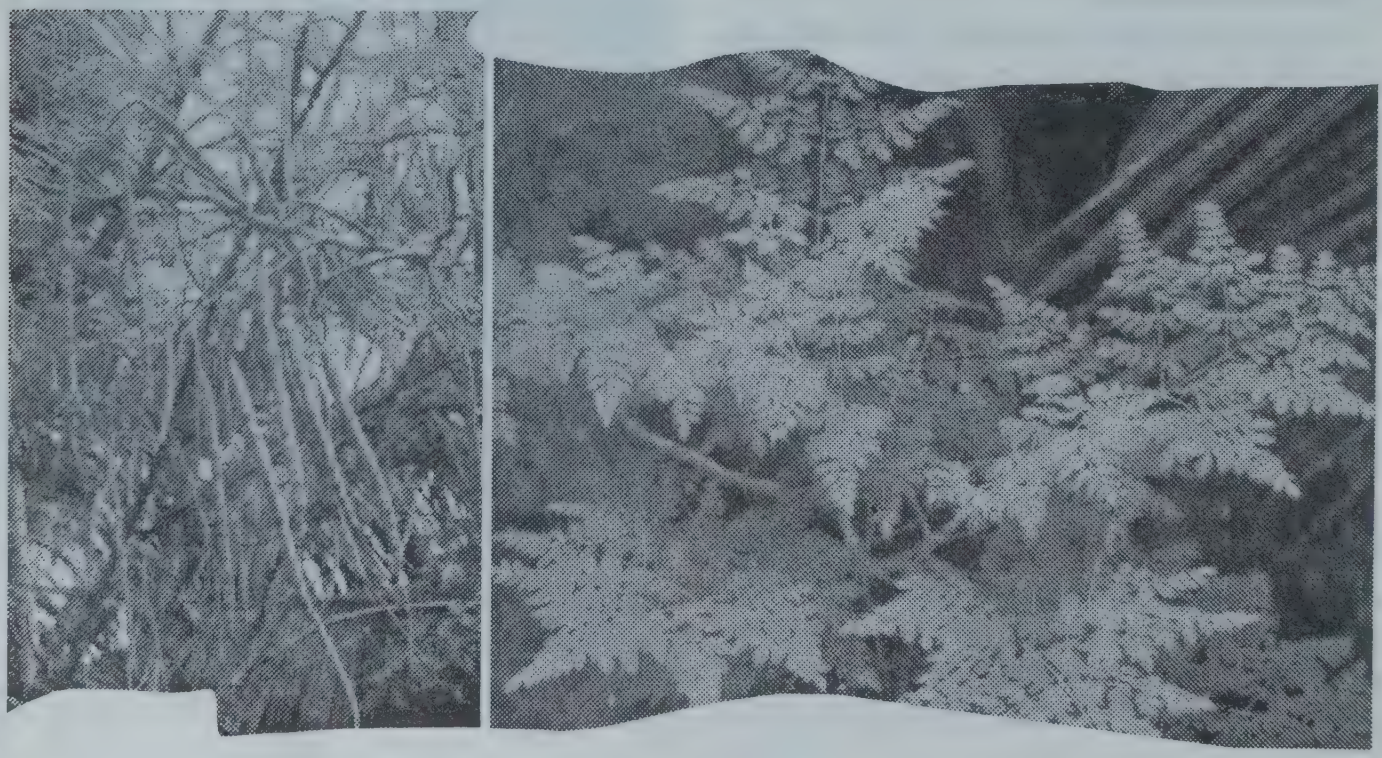
Wood

The wood provides fuel and a raw material for cellophane and textile production. The tree itself is commonly used as a living fence post.

Sources:

- *L.I.F.E. (publication of USAID)*

Sturtevant's Edible Plants of the World



Snuffing Out the Flame of Life

We are in the phase of what looks likely to be an unprecedented era of extinctions. There is good reason to suspect that somewhere between 500,000 and one million species are under threat right now. **By the end of this century, it is estimated, we could lose one million species.**

In its scale and compressed time span, this process of extinction will represent a greater biological debacle than anything experienced since life began: it will massively exceed the "great dying" of the dinosaurs and their kin, together with associated organisms, 65 million years ago, when a sizeable share of earth's species disappeared.

Extinction has always been a way of life on earth, **but the present wave of extinctions caused by human pressure and exploitation are calculated to be running at up to 400 times the natural rate.**

If large-scale habitat disruption and destruction continue to accelerate, we run a real risk that the diminished stock of species will not represent an adequate resource base on which natural selection can work to rebuild the rich panoply of life. We should be worried about the loss of diversity for its own sake and because it threatens existing, and potential future resources. But the implications of the headlong destruction of species for the future course of evolution are more worrying still. "**Death is one thing**", as Drs. Seoule and Wilcox neatly put it; "**an end to birth is something else**".

The Gaia Atlas of Planet Management.

• "I owe an allegiance to the 3.5 billion years of life that made it possible for one to be here, and all the rest of you too. We have a responsibility to the largest population of all, the hundreds of billions of people who have not yet been born, who have a right to be, who deserves a world atleast as beautiful as ours, whose genes are now in our custody and no one else's."

– David R. Brower, Chairman
Friends of the Earth

More is merrier

•Health of an ecosystem depends on the variety of species, say Margaret Palmer of University of Maryland and her team. They found when different species of caddis fly larvae grow together in a stream, they get more food and reproduce more quickly than when a single species grow in the same area. This is due to altered pattern of water flow because of coexistence of different species, they report in Nature.

—The Telegraph, 4th Feb 2002

• The one process that will take millions of years to correct is the loss of genetic and species diversity by the destruction of natural habitats. This is the folly that our descendants are least likely to forgive us.

– Prof. Edward O.Wilson Harvard University

• The erosion of genetic diversity is greater than the statistics on species loss alone would suggest. If a species with one million individuals is reduced to only 10,000 (which may still be enough to ensure the species' survival), it may have lost 90% of its races, populations, and other genetic sub-units, with a concomitant loss of half of its genetic diversity. This "concealed" erosion of genetic diversity is generally overlooked, although ultimately it could represent as grave a threat as the loss of the species itself. More immediately we are losing wild and semi-domesticated plants whose genes are essential if we are to maintain our major crop plants. Of the estimated 80,000 edible plants, only about 150 have been cultivated on a large scale -- and less than 20 provide 90% of our food. The more we bend these 20 plants to our needs, the more vulnerable they become - and the more they need infusions of genes from outside their own shrinking gene pools.

Genetic erosion

"The products of agro-technology are displacing the source upon which the technology is based. It is analagous to taking stones from the foundation to repair the roof."

—Prof. Garrisson Wilkes University of Massachusetts

•..*Indeed, the steady depletion of traditional varieties could leave the world's food supply precariously poised on the brink of a breakdown or famine since the vastly narrowed genetic base renders crops critically uniform, and thus conspicuously vulnerable to epidemics of pests and disease. Conversely, over thousands of years, generations of subsistence farmers in the Third World have developed an astonishingly diverse range of plant variability (adapted to local conditions). It is variability which should be protected to guard against epidemics.*

— S. Mohd. Idries
('Seeds and Food Security', by Sahabat Alam Malaysia)

It is folly to allow the idea to develop that it is okay to destroy habitats and retain all the species in zoos, botanical gardens or seed banks, with the dream of someday returning them to the wild.

— The Co-Evolution Quarterly, Fall 1978

I am with you on the importance of genetic diversity and I believe that plant breeders' rights are restrictive and ultimately counter-productive.

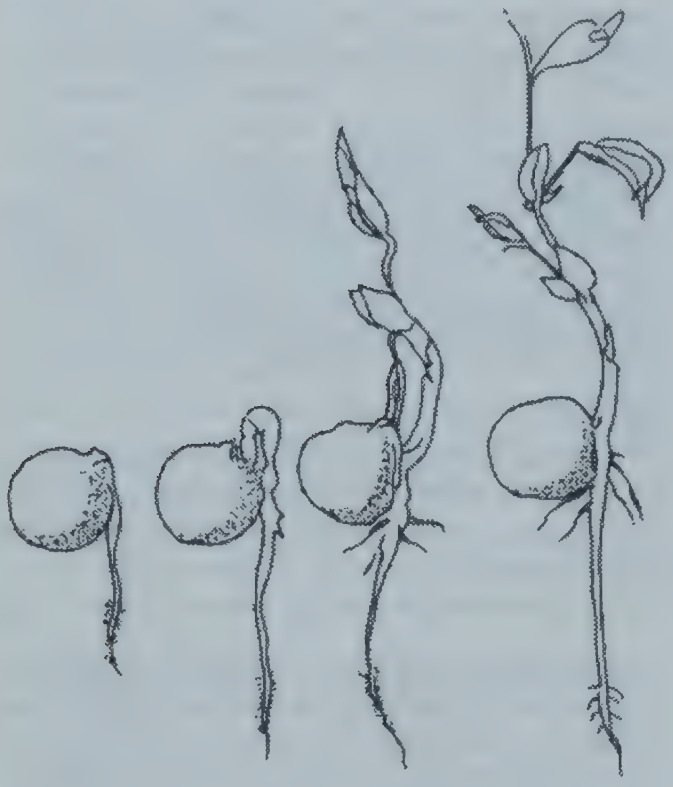
– Sir Joseph Hutchinson, Oxford, UK.

• **Like a child tugging threads from some** enormous piece of tapestry, we continue to tear at the web of life with little, if any knowledge, of the possible consequences.

— Dr. Norman Myers

Lifeline

On Decentralized Conservation of Plant Species. (A Summary of 'Seeds of the Earth' by, Pat Roy Mooney.)



The Issues

Some Third World farmers are opting out of the Green Revolution and returning to traditional crop varieties, because the so-called greening of the Third World is not working for the poor of many countries. Moreover, the Green Revolution is only the most visible part of a much larger agricultural revolution involving farmers and consumers everywhere — the 'Seed Revolution'. This revolution is guided by a relatively small number of multinational agrochemical/ pharmaceutical enterprises who are now moving rapidly into the seed industry. Because seed is so pivotal to the entire food system, the intervention of these international firms and their natural bias towards chemical inputs is of profound importance to the future food security of the world. The 'Seed Revolution' is being aided by two key trends: the move in the ThirdWorld towards a second phase of the Green Revolution, which will leave plant breeding to the multinationals;and, an attempt in the First World to create patent-equivalent protection and market control of seeds for the same multinational interests. Both trends are heavily influenced by private enterprise.

Much more needs to be known about the 'Seed Revolution'. The pace of change is rapid and difficult to analyze. Right now, national governments are making policy decisions related to a revolution which they have not planned and do not really perceive. The following is a summary of our findings, offered as a basis for further discussion and study :

a. The world looks to a handful of plants for its survival. Be it wheat, maize or rice, each of the earth's major crops has its genetic home in the Vavilov Centres of genetic diversity, located in the Third World. Although everyone draws from the germ plasm in these areas to maintain food supplies, the gene-hungry nations of the First World are especially dependent upon the Third world for their crop survival;
b. New varieties are replacing traditional cultivars and wild relatives in the centres of genetic diversity, wiping out sources for future plant breeding and leaving traditional farmers wholly dependent upon expensive new varieties,
c. Global companies have virtual control over the second phase of the Green Revolution, allowing them to 'package' inputs of seeds and chemicals with the help of government subsidies, foreign aid and higher farm prices;
d. As a result, agrichemical firms have constructed a global distribution system and marketing strategy for their seed and chemical products, at the same time as competition from traditional crop varieties has been reduced;
e. There is a widely-held illusion that vanishing germ plasma is being safely stored in regional and global gene banks. In fact, these banks are poorly funded and have experienced disastrous equipment failures resulting in the loss of precious genetic resources. More collections are urgently required in almost every part of the world;
f. The emerging network of gene banks takes national genetic treasures from the Third World to be stored abroad. In effect, these national resources cross a technological frontier, robbing the world's original plant breeders – subsistence farmers – of their rightful heritage, and leaving Third World governments dependent upon the First World for access to their own germ plasma. In Africa, examples already exist where nations have paid to imports, the immediate genetic offspring of their national resources;
g. An unknown factor in genetic conservation programmes is the extent of corporate collections. It is known that in some crops, a single enterprise dominates total world germ plasma holdings;
h. Protected by restrictive varietal legislation

(patents), agrichemical/pharmaceutical firms in First World are moving aggressively to achieve variety control in major markets. Smaller seed companies are quickly disappearing. Public Sector plant breeding is being virtually forced into doing basic research in areas of interest to the dominant companies;

i. Agrichemical corporations seek the development of plant varieties best able to stimulate chemical sales. The resulting bias can lead to greater crop uniformity and disease vulnerability as well as increased financial and environmental costs. The largest enterprises have created genetic research centres, cross referencing plant, animal and human chemical research;

j. Because of their involvement in several phases of the total food system, agribusiness plant breeders look to profits from several sectors. This enables them to breed seed suitable to their chemical, processing or retail interests, but not necessarily suitable to the profitability of the farmer or the nutrition of the consumer.

Conclusion

The 'Seed Revolution' has been discovered — and is being debated — at a time when it can still be halted and turned around. The financial resources and technical expertise required to collect and conserve endangered germ plasma is well within the political reach of governments and agencies. Knowledgeable governments can act to protect public breeding programmes and curtail the expansion of the global seed industry into their own territory.

The key to mobilizing the political "will" required to protect the world's genetic base lies in understanding some major myths:

a. the myth that the 'population explosion' threatens our food resources and makes necessary the kind of draconian development strategies evidenced by the Green Revolution;

b. The myth that the First World has the answer to increased food security through high energy-input production technologies; and,

c. the myth that agrichemical companies will bring innovation and creativity to plant breeding rather than uniformity and chemical dependence.

The creativity and genius of agriculture continues to lie where it has always been—with farming families.We do not propose a retreat to old technologies or a withdrawal of scientific expertise, but we do affirm that the long term security of a global food supply and the basis for plant breeding programmes must rest with the viability of subsistence farmers to maintain their rural life. These families will protect our plant genetic resources better than gene-banks and data centres.

We can still stop the 'seed revolution' engineered by agri-business multinationals and achieve increased crop genetic diversity through greater public involvement in conservation and breeding. It is not too late. However, whereas it has taken humanity ten thousand years to bring our food supply to its present state,we could do irreparable damage within the next decade.

— Pat Roy Mooney

Permaculture at Pashtapur

Pashtapur is a sleepy little village in Zaheerabad Taluk of Medak District, Andhra Pradesh. Like most villages in India, it depends directly on the land for its basic needs of food, shelter, water... The 'green revolution' with its demands of high irrigation and high external inputs is, at best, irrelevant here. Water is not a resource that people can afford to waste in this region. And Deccan Development Society, a voluntary non-governmental Organisation, with all its good intentions of helping rural development, realized soon enough the folly of digging tube-wells for irrigation. Every year witnessed a sharp fall in the level at which ground water could be found. An integrated approach was obviously needed - an alternative strategy aimed at ecological development of the available earth resources for meeting people's needs.

At the invitation of D.D.S, Bill Mollison, the pioneering genius behind Permaculture, conducted an intensive Permaculture Design workshop in Hyderabad from July 8 to 22,1987. He was assisted by Robyn Francis, editor of the International Permaculture Journal, and M.C. Pereira, who has an excellent permaculture farm in Nepal, and who is now in Kampuchea at the invitation of the Kampuchean Government to provide consultancy and help to train people in re-generating the ravaged landscape.

The July'87 workshop in India was attended by about 30 people from different parts of the country. The last 3 days of the workshop were conducted at Pashtapur where D.D.S had recently acquired a 3.5 acre plot of land. After the workshop, Bill and Robyn stayed on for a week, and together with Venkat and one or two other participants, planned the design for building a Demonstration Permaculture Farm. Apart from ecological re-generation of the 3.5 acre plot, the objective was to make a family of 10 members self-sufficient for more than 60% of their food/fuel/fodder etc. requirements within 5 years.

Accordingly, a Ground Plan was drawn up dividing the area into various ZONES as per P.C. Guidelines.

ZONE 0 — the 'inherited' old house.

Zone I — A very intensively cultivated Vegetable/ Nutrition production zone near the house to be laid according to the sheet-mulch method (water conserving).

ZONE II — A polycultural orchard of Legumes/Fruit with poultry on the free run and pigeons.

— A separate area of about 1-1/2 acres to be set aside for growing cereals/pulses/millets/oilseeds from the second year onwards. It was decided not to grow rice as this crop was unsuitable for low rainfall areas.

ZONE III & IV — Starting from the boundaries inwards, to consist predominantly of TREES to provide tree crop (fodder / fruit / fuel / mulch) resources.

The land survey had revealed large numbers of stray animals wandering within the farm, and powerful erosive winds from the south and west. The longest boundary was on the eastern side, hence a great resource from the sun sector. The soil was stony with little organic content and some areas having a bed-rock just a foot below.

All these observations made it obvious that some important FUNCTIONS had to be fulfilled on a priority basis, viz.,

— Fencing of the entire property, planting of Prosopis/ Juliflora, a locally available thorny species, suitable for life-fencing (hedge);

— Establishment of WIND BREAKS on the Southern and Western boundaries;

— Shaping the area so that no rain water leaves the field, thereby arresting sheet erosion, and ensuring maximum rain-water-harvest in the soil itself.

It was also decided that all grain production be deferred to the second or third year.

A detailed 12 page report (and species list) covering all the work done in the 18 months following the workshop has been sent in by Venkat. Some extracts are given below:

"In the first six months (July to Dec.' 87), Zone I was taken up as a DEMONSTRATION model and a great amount of vegetables/greens from over 20 varieties was produced. This thrilled and inspired the local people in the area and quite a good number of productive kitchen gardens were established by them around their houses in some villages. Domestic kitchen gardens are going to be established on a much larger scale hereafter.

A nucleus for Zone II (Orchard) was planted with 53 fruit saplings drawn from 10 species interspersed with 41 green manure and legume saplings drawn from 6 species.

On the whole, the period from July to December 1987 was exciting and generated a great deal of enthusiasm. January to June 1988 was again mainly spent on observation and planning for the coming monsoon of 1988, and the entire farm was fenced.

With the onset of the monsoon, delayed but good enough work commenced on a very large scale from June to December 1988.

An action plan for June/December 1988 had been earlier drawn up to cover:

Zone I -- more intensive production of vegetables.

Zone II -- To complete planting in the area earmarked for the orchard.

Zone III & IV -- To design an aerodynamic curved wind break to cover the entire southern boundary of 360 ft and take up planting work in it as well as in the linear western wind break.

In all the work undertaken, the following principles and guidelines of PC were adhered to:

— Work with nature, never against it; seek to integrate all life forms;

— Every function to be served for by more than two elements;

— Every element to serve more than two functions - energy conservation by Zonation, ... etc.

Let us take the Function of a wind break. The component trees can be raised to just break the force of the winds, in which case only one function is achieved. In PC designing, we can choose the species that go to make the components so that various other useful and needed functions are also fulfilled:

— Fixation of atmospheric Nitrogen;

— Harvest rain water through their deep root system;

— Provide green manure and abundant leaf litter for mulching and humus formation;

— Provide wild fruits and berries to attract birds which also act as pest controllers;

— Provide tree fodder, firewood, and some fruit;

— Timber for construction, etc.

So, in PC, a wind break is designed to be multifunctional. Similar principles are followed for the PC design of the orchard zone. An orchard needs water, protection from wind, nutrients and pest control, etc. All these functions can be consciously integrated within the orchard design by incorporating a perennial ground cover of Legumes which will arrest soil erosion, conserve moisture, increase fertility, and maximise rain water harvesting. By letting in poultry, lizards, frogs etc., efficient pest control can be attained biologically rather than by chemical methods.

Keeping these guidelines in view, a multi-functional wind break planting was started. By the end of December 1988, the following varieties had been planted and are thriving very well.

— Fruit 50 - (drawn from 9 species)

— Legumes - 490 (drawn from 12 species)

— Pest control - 14 (from 1 species - Neem)

— Others - 4 (drawn from 2 species).

i.e. a total of 558 plantings drawn from 25 species.

Similairly, all plantings on a Polycultural pattern, (a sort of guild), were done with:

198 tree Legumes drawn from 8 species;

127 fruit seedlings, grafts and layerings, drawn from 14 species and 2 pest control saplings of Neem i.e. a total of 327 plantings drawn from 23 species with a predominance of Legume saplings. Local breed of chicken are on free run. More will be let in.

Plantings were also done in the linear western wind break with 30 casuarinas and 58 Glyricidias — 88 in all.

Once again, during June/December 1988, vegetable production was very successful. Very many varieties were raised and yield even distributed to some Balwadis. The Winged Bean (seeds given by Robyn) was introduced and gave a bumper yield. Seeds have been collected for distribution to villages. So too radish (Seeds from Fukuoka San) proved a great attraction.

Altogether in the 18 months a total of 1132 saplings have been planted

Tree Legumes		885
Fruit		227
Pest control		16
Others		4
	Total	**1132**

In all the plantings, the following practices were adopted:

No wide and deep pits were ever dug for any of the plantings, all plantings were done in small holes from seedlings raised in plastic bags

Plenty of coconut fibre (cut into small bits) and other waste organic material including dry leaf litter were used as mulching. Stone Mulch was also used.

Very minimal farm yard manure with a scattering of Bone Meal, neem cake, and Dolomite/Lime were the only additives to the soil. No inorganic chemical fertilizers or pesticides have been used.

So far, there has been no pest or disease problem. The work done so far has been to arrest wind and sheet erosion of soil, harvest all rainwater into the soil itself, raise large amount of vegetables, lay the basis for production of Biomass, and allow chicken on the free run. All these will surely lay the foundation for a Permanent Agricultural system for the production of food/fuel/fodder on a perennial basis. With most of the needs found within the farm itself, as it evolves, sustainability is assured."

— Venkat

(Extracts taken from his report dated 10/5/89)

FRUIT SPECIES PLANTED AT PASTHAPUR:

	CommonName	Botanical Name
1.	Amla	Embelica officinalis
2.	Areca Palm	Areca catechu
3.	Banana	Musa
4.	Ber	Ziziphus mauritania
5.	Custard Apple	Anona ?
6.	Coconut Palm	Cocos nucifera
7.	Citrus	
8.	Cherry, Barbados	Malphigia ?
9.	Cashew	Anacardium occidentale
10.	Drumstick	Moringa pterigosperma
11.	Guava	Psidium guazava
12.	Indian Almond	Terminalia catappa
13.	Jack	Artocarpus integrafolia
14.	Jamoon	Syzgiim cummini
15.	Mulberry	Morus nigra
16.	Medi	Ficus glomerata
17.	Mango	Mangifera indica
18.	Papayya	Carica papayya
19.	Pomogranate	Punica granatum
20.	Passion fruit	Passiflora edulis (Yellow)
21.	Star Gooseberry	Phyllanthus acidus
22.	Sapota	Achras zapota
23.	Tamarind	Tamarindus indica
24.	Toddy Palm	

AND OTHER SPECIES

1.	Acacia nilotica	Babul
2.	Acacia auriculaformis	Bengal Acacia
3.	Acacia albida	
4.	Acacia albizia labeck	
5.	Bamboo	
6.	Bahunias	
7.	Casuarina	
8.	Casia siamia	
9.	Glyricidia maculata	
10.	Inga dulcis	Madras Thorn
11.	Leucania	Subabul
12.	Neem	
13.	Pomgamia glabra	Kanuga
14.	Prospis juliflora	
15.	Prospis cineraria	
16.	Sesbania grandiflora	
17.	Sesbania egyptica	
18.	Sesbania rostrata	

Some other local species which are to be identified.

Rishi Kheti

On the pioneering experimentation in India along Fukuoka's way of Natural Farming, and how it inspired many others. A brief narration of its early days at Friends Rural Centre, Rasulia (Hoshangabad, M.P.) and its further unfolding at the Titus family farm, a few kilometres away.

The Titus farm house is surrounded on three sides with a thick growth of lush vegetation. The soil is very fertile, and the land harbours a rich variety of plant species, many of which are edible. The discerning visitor can see that a food forest is shaping here.

Raju & Shalini confess that all they did on this part of their land, four years ago, was to hedge the boundary to protect from intruders like stray cattle. And then they scattered many, many seeds. This was an experiment which seemed quite mad to most people, but nature obviously appreciated it.

No tilling, no weeding, no chemicals, no compost - a strange way of farming, indeed! Masanobu Fukuoka calls it 'Do Nothing' farming, but Pratap Aggarwal prefers the name 'Rishi Kheti'. The Rishis or great saints of India never worried about their material needs. They gave freely of themselves, and nature provided from her generous bounty all that was needed for sparkling health.

In 1984, Pratap Aggarwal was the coordinator of the Friends Rural Centre when they published the Indian edition of Fukuoka's 'The One Straw Revolution'. Inspired by this classic, the first experiments in India along Fukuoka's way of natural farming were started at the Centre in Rasulia.

The One Straw Revolution has been described as "a book that will transform your life". It surely transformed the lives of Raju and Shalini Titus and their family members. For many others, it has at least touched some tender, receptive spot with its simple, lucid rendering and warm spirit. And because the subject itself is of such urgency, the book ranks among the alltime greats in the story of the written word.

In early'85, the Titus farm was reeling under the numerous side-effects of the 'green revolution'. Twenty years back, this farm had been among the first in the area to adopt the modern method of farming with chemical fertilizers and pesticides. The years had taken their toll, and progressively, new problems had appeared. Considering the heavy expenses, the work burden, the tension and increasing health problems, Raju and Shalini were now wondering whether continuing thus, they would be gainers in any way at all.

Raju's mother, Paulina, was then the principal of the Women's College of Hoshangabad. She frequently visited Marjorie Sykes, the energetic nonagenarian member of Friends Rural Centre, who had worked with both Tagore and Gandhi, and was widely respected as educationist and teacher. Marjorie told Paulina about the experiments in rice-cultivation being tried at the Centre following the no-till method of natural farming which re-cycled the straw after threshing. Partap persuaded her to take home a copy of One-Straw Revolution for Raju.

At that time, however, the subject was very unpopular at home. Even the word 'farming' had developed unpleasant associations for Raju, who barely touched the book for a month or more after it came. Then, casually glancing through it without any expectation at all, something began to jell.

The book grabbed Raju's imagination, and became the focus of all attention. He and Shalini spent many hours going through it, covering some passages two or three times. They let the ideas sink in for a while, and then radical decisions followed one after another in rapid succession.

Raju and Shalini knew they had nothing to lose. They realised that the modern, chemical method had become uneconomical for them, and they could see how the land had degraded before their eyes. They also intuitively felt that Fukuoka was right, and this gave them the sense of freedom and confidence to make basic changes without being miserly in their

"A Natural Farm is at once a forest, an orchard and a vegetable garden."

The essence of Natural Farming experimentation is the mixed planting of a large variety of seeds to find out the suitability of species to the land and climate as it is right now.

The best time for planting a particular variety, the inter-cropping sequence, and the compatibility of species are some of the considerations relevant to natural farming experimentation.

approach.

The dairy at the Titus farm was well known, and their Jersey cows a major supplier of milk in the area. Selling these was perhaps the toughest decision of all. But Raju was convinced that the cows were too great a pressure on the land. As he reasoned, the central strategy of natural farming is to regenerate the soil with a dense ground cover of green. The vegetation may be wild grasses or shrubs, leguminous species (like Fukuoka's clover) or edible plants like vegetables, herbs and tubers. To allow such a ground cover to grow undisturbed, cows were a serious handicap right from the beginning. And so the family members reluctantly agreed that they had to go.

Other major decisions included the total stopping of chemical inputs, and the discontinuation of tillage. The weeds that came up were not uprooted, and to an outsider, it seemed as though the farm had been abandoned in distress.

During my visits to the Titus farm, Raju and I would often walk through the vegetation, and settle down at a favourite spot - a shaded green bowl ringed by many trees. Stretching ourselves on a thick carpet of wild grasses under the canopy of wild bers, babuls and many other species, our conversation frequently dwelled on the role of weeds, the philosophy and rationale of natural farming, and parallels between soil health and body health.

I first met Raju Titus in July '87 at a permaculture workshop in Hyderabad conducted by Bill Mollison. Raju had come alongwith Shiva, who was then one of the persons looking after the natural farming plot at Friends Rural Centre, Rasulia. A year earlier, I had read One Straw Revolution, and was greatly impressed by the book. Though I was almost as ignorant about farming as the next city person, the simple, clear and conversational style of the book was so gripping, that I completed it virtually at a single stretch on a train journey between Calcutta and Bombay. I had later heard that some experiments in natural farming were being tried at Hoshangabad, and was eager to know how these were shaping.

About 8-10 months after the permaculture workshop, I went to Hoshangabad on the first of my several visits to the place. At Rasulia, I was very sorry to learn that Shiva had left the Centre a few months after Pratap Aggarwal resigned in January'88. And before the rest of 1988 was through, several other persons involved in natural farming also left. Some have formed into an organization called Vikalp to pursue natural farming independently. At the Centre itself, the natural farming efforts now seem to be in the doldrums, and need all the support or encouragement anyone can give.

The Titus farm on a 14-acre plot is barely 3 or 4 kilometers from the Friends Rural Centre, Rasulia. A narrow canal, about 5 feet wide, runs through the land, dividing it into one small plot of about 3 acres surrounding the farm-house and a larger plot of 11acres, which for 20 years had been used for grain cultivation using the modern, chemical method. No chemicals were used on the 3 acre plot near the farm-house, and it is this area which is now covered with thick vegetation.

The soil on the land across the canal has improved greatly since changing to natural farming. But this part of the land is still not free of problems, and the vegetation here bears no comparison to that on the 3 acres near the farm-house, which is truly inspiring.

One thing is very clear from this. If the soil is healthy, the natural way of farming provides generous returns with the minimum of effort. If, however, the soil has been devastated by wrong effort, it is vital to aid the process of humus formation, which is the critical factor in fertility. Recycling plant matter as mulch, the use of living mulch (varied ground cover of vegetation), and integrating green manure (leguminous, nitrogen fixing species) all greatly help this process of humus formation.

Meanwhile, the farmer must check the temptation of growing monoculture crops for sale. This does not mean that the farmer should patiently starve for a few years, while the soil recovers. It is still possible to get smaller quantities of a variety of foods for the family. Such a modification of diet requires adjustment, but is sure to improve health. Even pampered taste buds can be catered to by imaginative preparation, if preferences are not too fixated by prejudice.

The modern diet is extremely poor. While there are thousands of edible plant species on earth, commercial agriculture has banished most of these from the lives of people. More than 95% of what an average family eats consists of less than half a dozen items. This is because financial manageability is impossible with an abundant supply of a great variety of foods. And of course, for agribusiness, money profits overshadow al all other considerations.

In natural farming, it is common to find 'wild' edible species appearing without having been planted by the farmer.

Each year, the Titus family discovers a number of

such species which "came on their own". It is usually an outside visitor who first points out that a particular herb, fruit, vegetable or tuber is a valued delicacy in their part of the world. Unfortunately, most of us have corrupted tastes and are reluctant to try anything new, no matter how healthy or tasty it is said to be.

Modern man is greatly burdened by many anxieties. Rest-less, he keeps wondering what he should do next. And often he forgets why he is toiling so hard. Only the habit lingers while the pleasures wither.

Natural farming affords a gentler pace to savour the no wonders of life. Dusting out the knotted cobwebs of our minds, we can begin to see the world in a balanced, whole perspective. Nature can look after itself and us. But as Thoreau says, "One who eats the fruit should at least plant the seed"

—Bharat

My Stay at the Titus Farm

Inspired by Fukuoka and his ideals, I visited the Titus farm at Hosbangabad, where they are trying to emulate his example. After staying there for a month, I was beaming with confidence to do Natural farming myself.

Having been to a Natural farm in Agali of Palghat district, Kerala, the idea was not new to me. But this first exposure was just a glimpse, and I was unable to make head or tail out of it. Though I stayed with the Titus family for only a month, I understood something about Natural farming, and also realised the necessity of living with Mother Nature.

During my stay, I did harvesting, threshing and winnowing of Chana, Mattar & Thuvar with the family members. Standing in the midst of the trees and grasses in the sunshine, each moment was a glimpse of the sheer pleasure to be found in harmony and oneness with Nature.

For twenty years, the grainfields here were ravaged by heavy tillage and the dumping of chemical fertilizers and pesticides. Natural farming was started only four years ago, but already the fields seem to be smiling. Oh, Mother Nature, you really are a mother. How infinitely patient you can be,despite our devastating exploitation of you.

Problems are there,but much less compared to what the other farmers face. The land which was on the verge of collapse, cannot regain its strength all of a sudden. By perseverance, the position must improve. Slowly, but surely, the land will regain its vitality.

There is no "cut and dried" formula for Natural Farming - only some basic, universal principles. According to the situation, new variations can be applied by using one's imagination. One can do natural farming on one's own. And one can learn and benefit a great deal by observing what Nature has to teach us. As W.H. Davies said, life is worth very little if we have no time to stand and stare at the wonders of Nature.

— Prabhat Menon

The Importance of Weeds

The Oxford dictionary defines weed as "a wild herb growing where it is not wanted."

Before man began to rule what he wants and does not want in nature, all plants were wild and the concept of weed was irrelevant. Today, modern agriculture with its mono-culture cash crops has become very fussy. It cannot tolerate plants that are external to its factory-style production. What the soil needs, man may not want. And thus what nature provides unasked becomes anathema to man with his narrow focus on immediate profits.

Weeds, like other plants, play a very important role in nature. Often, they are nature's way of ameliorating conditions arising from short-sighted and exploitative land-use.

As Dr. Zonn points out in the article, 'The Living Soil', plants perform, to a greater or lesser extent, the following functions in relation to the soil: They bind the soil with their roots, which also till the earth and improve soil aeration. They aid moisture absorption and retention. The leguminous varieties fix atmospheric nitrogen in the soil. They encourage micro-organisms and earthworms to proliferate near the roots. They moderate the temperature of the land. And when plants die, they re-cycle their fertility back to the land in an easily assimilable form.

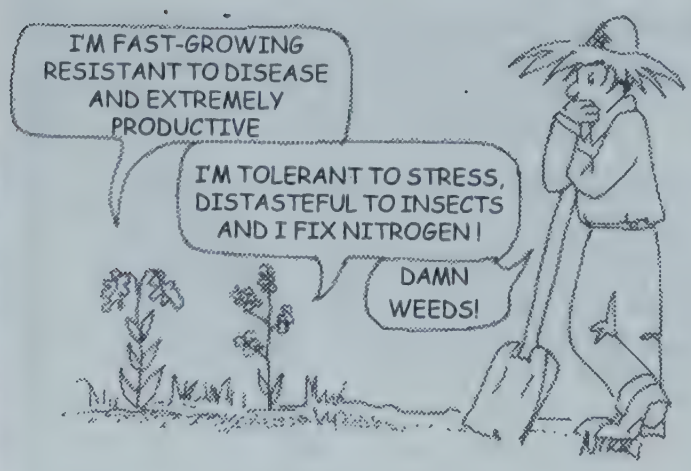
Wild grasses and shrubs (weeds) that appear without being planted by the farmer may not have an obvious value for sale or consumption. But they still perform many other critical functions, which often are exactly what the part of the earth there needs at that given point of time.

Consider, for example, two common wild species: the babul tree (a native acacia), and the 'kaans' weed (crab grass?). Travelling between Bombay and Calcutta by train, one can see the landscape (particularly in M.P.) generously dotted by these wild varieties. What functions do they perform?

The Babul is commonly used as fuel, timber and 'datun' (a six inch cutting of a stem which is chewed and then used as a toothbrush and mouth refreshner). However, far more important than these obvious functions, is the leguminous characteristic of the Babul in fixing atmospheric nitrogen in the soil, and thus aiding its fertility. In eroded terrain with a large live-stock population, this thorny acacia is well adapted to survive, while it quietly regenerates the land unsung.

The 'kaans' weed is widely perceived as a tormentor. It has taken over the grain fields of farmers who have indiscriminately adopted heavy tillage and adding of chemicals, while neglecting to re-cycle plant mulch which is so vital in the formation of humus and in providing the topsoil with a crumb structure that can better resist erosion.

The 'kaans' grass sends its roots deep into the soil, and binds the soil to protect it against erosive forces like strong wind and rain-water runoff. It is thus an ally in checking the spread of desertification. By resisting


I'M FAST-GROWING RESISTANT TO DISEASE AND EXTREMELY PRODUCTIVE
I'M TOLERANT TO STRESS, DISTASTEFUL TO INSECTS AND I FIX NITROGEN!
DAMN WEEDS!

! *The less of routine, the more of life...*

-Amos Bronson Alcott

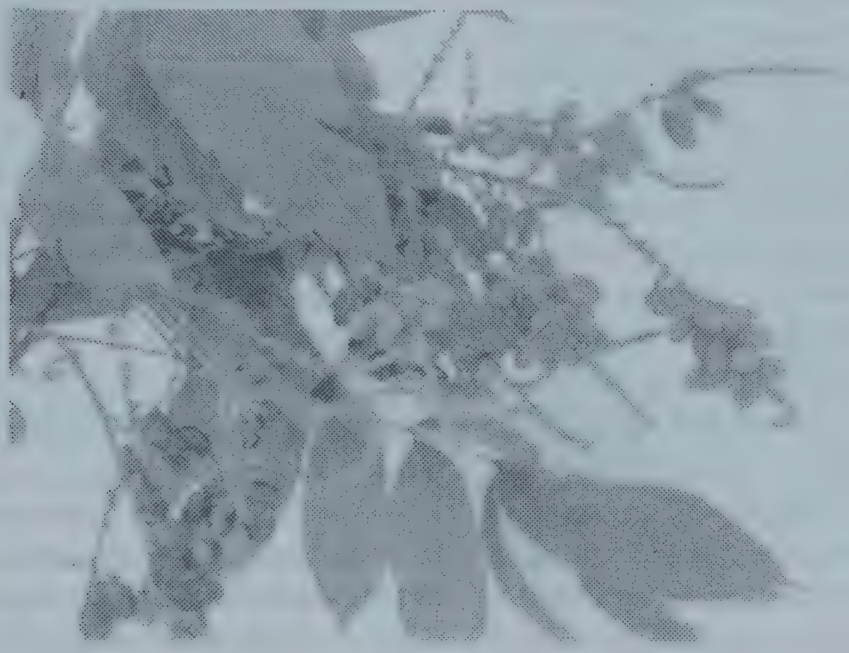
! *Very simple ideas lie within the reach only of complex minds.*

- R. De Gourmont

the cultivation of rice or any other monoculture crop, it seems to be sending signals to the farmers -- Go easy here! But the farmer, caught in a vicious cycle of poverty, responds by tilling and adding chemicals with a renewed fury. Though he can see the problem getting worse each year, he seems unable to stop. The turning of the soil brings up weed seeds from deeper layers, and the degradation of the land increases, further necessitating the function of the weeds. 'Modern' agriculture seems to have gone bankrupt of ideas, and the Ministry of Agriculture is reported to have announced a reward for anyone who can suggest a solution that can effectively eradicate the weed!

Natural farming does not look upon weeds as a disease. Rather, such wild grasses are seen as friends that play an important role in farming, and a variety of these are welcomed. When there is rampancy of one or two species of weeds, natural farming recognizes the need to control them. But the weed per se is not an enemy to be combated. The strongest weed grows where the soil is most eroded. Weed is thus seen as a symptom with a curative function in restoring the health of the soil.

"Complex & intensively developed systems are almost immune from weed rampancy. Such rampancy is a result of over-extension,broad scale pollution,or other damage caused by people and their domestic animals,or short-sighted agricultural practices. As the causes lie in our approach to nature, so the cure lies in our self-reformation and in a sensible approach to natural systems."



Farming among the Weeds

Many different kinds of weeds are growing with the grain and clover in these fields.

A local farmer who had expected to see my fields completely overgrown by weeds was surprised to find the barley growing so vigorously among the many other plants. Technical experts have also come here seen the weeds, seen the watercress and clover growing all around, and have gone away shaking their heads in amazement.

Twenty years ago, when I was encouraging the use of permanent ground cover in fruit orchards, there was not a blade of grass to be seen in fields or orchards anywhere in the country. Seeing orchards such as mine, people came to understand that fruit trees could grow quite well among the weeds and grasses. Today orchards covered with grasses are common throughout Japan and those without grass cover have become rare. It is the same with fields of grain. Rice, barley, and rye can be successfully grown while the fields are covered with clover and weeds all year long.

– extract from *The One-Straw Revolution*

Controlling Weed Rampancy

The needs of the farmer cannot wait while the land regains its health. So, what can be done to control weed rampancy as in the case of kaans grass?

In natural farming, the following measures suggest themselves as some of the possibilities worth exploring. It would be foolish to expect quick results. But one can hope to ease the transition period so that it is possible to get some yield while helping the land regain its health a little faster. Seeing weed rampancy as a symptom, soil erosion and degradation as the disease, and exploitative land use as the underlying cause, the first logical step would be to remove the cause of the problem. This means stopping chemical inputs, avoiding or minimising tillage, and abandoning monocultures in favour of mixed planting and rotation of main crop. Without tackling the underlying causes, any attempts to suppress the symptom of weed rampancy would resemble a monkey trying to climb a greasy pole going up a foot and slipping two.

By treating the soil and plants as an organic whole, and helping to correct imbalances, the self-healing process of the land may be hastened. As the crumb structure of the soil is regained, a more suitable ground cover of vegetation can replace the functions which the rampant species of weed, performed. A critical factor in restoring soil health is the recycling of all plant matter as mulch. Simple earthworks like swales/ contour bunds can help in checking soil erosion.

At another level, weeds also need to be tackled more directly to enable some yield to the farmer during the transition period to health by natural means. In practical terms, following methods may be adopted:

i) Planting an assortment of seeds and observing what grows best in the existing situation of weed rampancy. The assortment may include species of other wild grasses, so that some 'friendlier' weeds compete with the rampant species and take over its ground cover function of checking erosion, while also allowing some other edible species to grow through it. An example of this is a wild variety which Raju refers to as 'Rishi Kripa'. It is itself edible, and has the desired characteristics of vigorous growth, etc., except that it is not leguminous.

ii) Leguminous species are the green manure gifted by nature. If these are liberally integrated in the farm, the use of nitrogenous fertilizers or compost becomes quite irrelevant (or rather, undesirable). While nursing over-exploited grain fields back to health, a mixed and rotational cropping of legumes is very helpful to the land, and also gives better yield to the farmer. In Fukuoka's farm, a leguminous ground cover of clover is used both in the grain fields and orchard. In the strategy of alley/avenue-cropping, leguminous trees like various acacias (babul, subabul, etc.) play a major role in growing food crops. In general, it seems desirable to integrate some trees (acacias, neem, drumstick, etc.) in the grain field.

iii) In fields that are completely overgrown with rampant species of weeds, these may be slashed and loosely laid back on the ground. Or better still, the weeds may be flattened on the earth by trampling or any other suitable method. Such a strategy allows other plants a headstart to get well established before the weeds can recover. The roots of the injured weeds pull up nutrients from deeper layers at a faster rate for self repair at the surface. These nutrients also help the other plants. Meanwhile, the weeds continue to bind the soil against erosion, till such time another suitable groundcover takes over this important function.

iv) A faster method of weed control, suitable for small areas, is the sheet mulch method of gardening for intensive food production. [Refer "The Kitchen Garden Revolution"]. Here the weeds are trampled or slashed and laid back on the ground. Their re-emergence from underneath is checked by the layers of sheet mulch placed above it. A variety of weed barriers may be used to prevent their re-invasion from the sides. This method gives yield in the very first season. And each year the soil and yield improves.

Our Experience in Rishi Kheti

We can say from our little experience that natural farming has the potential of providing health and happiness to all who embrace it. Thinking back, it seems that twenty-two years of our life, following modern methods of agriculture and dairy, have gone in void struggle and tension, only to bring the land, to the verge of ruination. But in the past few years, we have found a small ray of direction for honest living.

Much of the education given to us by society has been a dead-weight around our necks. We have been given to believe that modern technology is the only way for progress. We are socially conditioned to fear snakes, tigers, the dark, and even forests. Walking barefoot, or soiling our hands with the earth is looked upon as undesirable. We are taught that work is life, and that we must extract profits by our labour. Heaven is not on this earth, but something to strive for in another world...And finally , we have been disillusioned.

Thanks to 'The One Straw Revolution', and Pratap Aggarwal's experiments in Rishi Kheti, we discovered the actual reasons for our degraded soil. We realised the advantages of light ploughing or no ploughing at all. And for the first time, we really understood the vital role micro-organisms and earthworms play in building a fertile topsoil. Abandoning chemical inputs, tillage and weeding, we switched over to natural farming. Now, we feel relieved of the tensions and fatigue that had reduced us to mere beasts of burden.

We have stopped using hybrid seeds and prefer indigenous varieties. Wild grasses are no longer a source of anxiety, for we know that they help the soil. Seeds are usually scattered directly on the earth. Sometimes we make seed pellets using clay. If needed, we cover these with the cut-backs of weeds and straw, or a layer of leaf mulch.

We are particularly successful with leguminous varieties: soya bean, tuar, black and green gram in the rainy season, and, lentil, vetch, linseed, chana and peas in winter. Each year we get increasing yield. In summer, an experiment with green gram and lobiya has given satisfactory results.

Fruit trees, wild trees and shrubs grow without any special attention. Besides several varieties of acacia, we have mango, jamun, stone fruit, Bel, ber, guavas, margosa, custard apple, flame of the forest, etc. Branches of thorny trees are sparingly pruned for fuel and fencing. Hypomia and 'Navrang' bushes are good as a live hedge. They also help in checking soil erosion and protecting from wind.

Vegetable seeds are scattered here and there among wild grasses between trees. We get ridge gourd, bitter gourd, snake gourd, bottle gourd, brinjal, tomato, chillie, pumpkin, beans, cucumbers, lobiya, a variety of leafy vegetables, radish, carrots, ginger, turmeric, etc.

We found that when we were weeding the weeds grew back vigorously. Now, these are weakening, or even disappearing, while other plants grow healthier. Where we find that weed control is needed, we scatter 'burseme', or seeds of other wild grasses. Leguminous varieties usually grow faster than the weeds and also perform the function of green manure. Sometimes, we cut back or trample the weeds flat on the ground to allow other plants a headstart. Weeds near fruit trees or other trees are left alone, as the trees suffer if these wild grasses and shrubs are removed.

At present, we give light irrigation using sprinklers. But as the moisture absorption and retention of the land improves,there is progressively less need for irrigation.

A fortnight before harvesting the crop in the fields, we scatter seeds in the standing crop. Harvesting is then started while germination is going on underneath, but no damage is done, as the plants recover in no time. After threshing the crop, the straw is scattered at random over the growing seeds.

Our whole family lives on the farm which is about 2 km from Hoshangabad town. Besides my wife Shalini, there is also my mother Paulina, our daughter Ranu, and son Madhu. We get much of our food directly from the farm, but as yet there is little income from sale of produce. We are confident, however, that in a few years, we will become entirely self reliant for all our needs.

I can say from this little experience that if the topsoil is saved and the humus is helped, all will be well.

— Raju Titus

The Mohanpur Experiment in Natural Farming

(Extracts from the Second Interim Report, June 1988, A Research Document prepared by Gandhi Peace Foundation and IIT, Delhi; 30 pages, Price Rs. 15/-. Available at Gandhi Book House, 1, Rajghat Colony, New Delhi-110 002 and at Classic Books.)

Introduction

Since December 1985, an on-going experiment in natural farming is being conducted at the farm of Shoor Vir Singh in the village, Chanda Nangli Mohanpur of Bijnor District, U.P. The experiment jointly involves (i) some local farmers, (ii) some staff members at the Centre for Energy studies and the Centre for Rural Development with Appropriate Technology at IIT, Delhi and (iii) the Research wing of Gandhi Peace Foundation.

The focus of the experiment is to investigate the possibility of farming in Indian conditions using concepts put across by the Japanese farmer-researcher Masanobu Fukuoka.

The four basic principles enunciated by Fukuoka are :

1. No cultivation, that is, no plowing or turning of the soil. For centuries, farmers have assumed that the plow is essential for growing crops. However, non-cultivation is fundamental to natural farming. The earth cultivates itself naturally by means of the penetration of plant roots and the activity of micro-organisms, small animals and earthworms.
2. No chemical fertilizer or prepared compost. If left to itself, the soil maintains its fertility naturally by developing an ecological balance in accordance with the orderly cycle of plant and animal life. Artificial efforts to increase productivity by adding chemicals ultimately drain away essential nutrients and deplete the fertility.
3. No weeding by tillage or herbicide. Weeds play their part in building soil fertility and in balancing the biological community. As a fundamental principle, weeds should be controlled, not eliminated. Making a mulch using straw, providing a ground cover of white clover, and temporary flooding are the examples of how this controlling can be accomplished.
4. No dependence on chemicals or pesticides. Nature, left alone, is in perfect balance. Harmful insects and plant diseases are always present, but do not occur in nature to an extent which requires the use of poisonous chemicals. The sensible approach to disease and insect control is to grow sturdy crops in a healthy environment.

Within the confines of his four principles, Fukuoka encourages innovation and creativity. There are no standard 'procedures' for natural farming. Each farmer has to build up his own relationship with his piece of land, and learn to be creative. Like in any mother-child relationship, there can only be broad guidelines and principles, no set rules.

Fukuoka's ideas caught our imagination two and half years back as a good example of technology that could provide an answer to the many problems in our agricultural sector that are a result of the modernization process.

The Experiment

Shoor Vir's family has been resident in Mohanpur village for decades. His brother, Dr. Yash Pal Satya, teaches at IIT, Delhi, and has been an active member of the informal Study Circle that researchers at Gandhi Peace Foundation and IIT have been conducting since 1979.

Shoor Vir agreed to set aside a certain portion of his farm (out of the approximately 9 acres of land that his family owns) for the natural farming experiment. Currently the area under trial, using Fukuoka's principles, measures approximately three acres.

Way back in October 1983, Shoor Vir had set aside a small plot of 1.5 bighas for trying out farming techniques without the use of any chemicals. This was a consequence of his feeling, which had accumulated over the many years he had been using modern farming techniques, that chemicals and pesticides are harmful rather than helpful in the long run. The possibility of dispensing with tilling, weeding and composting had not struck him until in January 1986, we brought to his notice Fukuoka's book and its application in Hoshangabad, at the farms belonging to (i) the Friends Rural Centre, and (ii) Raju Titus. After considering the matter carefully, Shoor Vir agreed to try out this novel, and initially 'strange' approach to farming.

The natural farming experiments were designed more to enable a careful study of the land and its behaviour rather than to increasing yields. Some of the interesting observations recorded were:

1. If natural farming is to be practised, then a mix of

several seeds has to be sown. The mixture needs to be selected carefully, such that each plant aids the other and the combination approximates the natural ecological balance as closely as possible. For this, indigenous seeds are preferable to hybrid ones.

2. Despite refraining from tilling, the land remained soft and porous. This was a consequence of the activities of various insects such as earthworms and 'makoras'. Not only insects, but birds and bees were beginning to appear on this small patch of land in much larger numbers than the adjoining plots. The natural farming practices made the land much more 'alive', i.e. teeming with living beings, both at the microscopic level in the soil, as well as at the macro level and thereby contributing to the fertility of the land.
3. Even the so-called harmful insects seemed to be playing a positive role. For instance, we were rather scared when termites appeared. But we discovered that the termites eventually proved useful allies, attacking only the cut straw and converting them into useful, soft soil through their excreta, but leaving the crop-bearing plants alone.
4. Similarly, the weeds also did not prove to be an impediment to a healthy crop. Thus, urad was plentiful despite being surrounded by 'chidia badi', and chana did well in the midst of dense layers of 'dhoop'.
5. Many new varieties of weeds and plants automatically made their appearance on this patch of land. Among them are some whose usefulness in herbal medicine is well recognized by the Ayurvedic practitioners of the area. We are now keeping a register in which samples of these plants are preserved, along with their properties and uses.

Encouraged by the above, we decided in April 1987 to extend our experiment to cover approximately three acres of land.

The major crop was 'dhaan'(paddy), which yielded approximately 1.25 quintals per bigha, i.e. 6 quintals per acre. In the Bijnor area, this compares quite favourably with farmers using fertilizers and chemicals and sowing dhaan. If instead of dhaan, munji is sown (the modern way), the output can go upto 15 quintals per acre. But this is the yield only in a good season, while the average is much less.

The cost of inputs required to produce 15 quintals per acre is also quite high. Generally, about two-thirds of the farmer's revenue gets eaten up by what he has to pay for fertilizers, pesticides, interest rates, etc. Further, this input/output ratio is increasing at an alarming rate, necessitating application of more and more fertilizers and micronutrients with each passing year. Therefore, from the economic view point, this higher output of 15 quintals per acre is not really attractive.

There are also many non-quantifiable benefits of natural-farming, which do not come through easily when the output figures are being compared. For instance, the quality of the output we obtained was excellent, especially in dhaan, and urad. All the neighbouring farmers were unanimous in their evaluation in this regard. Improvement in soil fertility, and a more varied yield are the added benefits, apart from the labour saved through not ploughing or weeding.

Various crop combinations were tried to study their compatibility and their suitabilily to the existing conditions. We found that some combinations of seeds work well because they support each other, while other combinations are not so good. For instance, masoor seemed to go very well with sarson, tari and alsi, but not with wheat, because the latter got damaged when masoor, which gets ready 10-15 days prior to wheat, was being harvested.

The major criteria for determining plant compatibility are the shape, height, depth and nutrient requirements of the plants. For instance, where samai has been selected as the principal crop, we have also introduced jowar, bajra and arhar, because the roots of the samai plant penetrate only into the top soil, whereas jowar and bajra go upto medium depth and arhar goes quite deep.

By and large, the results were very encouraging, keeping alive our hopes of making natural farming a viable alternative.

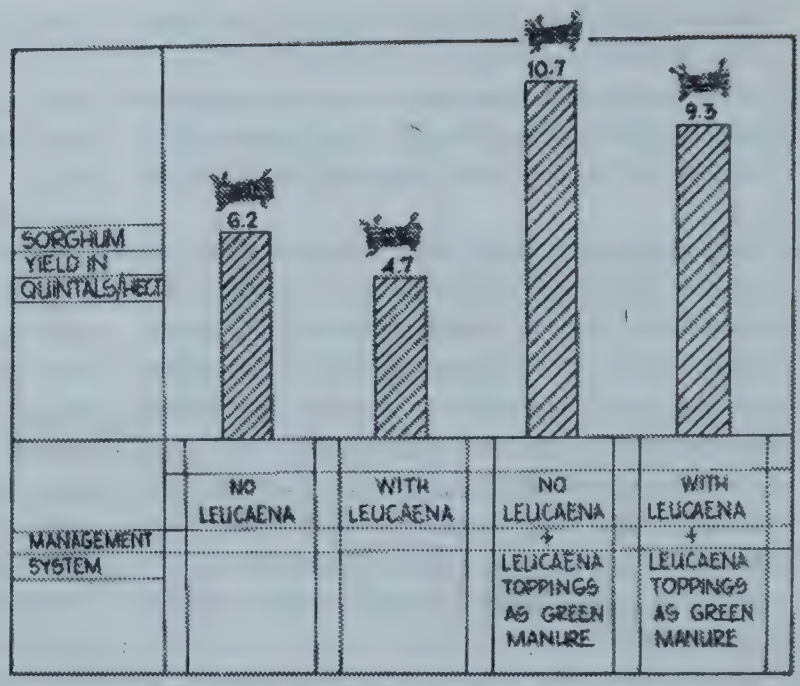
(Extracts from a research publication by Gandhi Peace Foundation, and I.I.T, Delhi.)

• The ultimate goal of farming is not the growing of crops but the cultivation and perfection of human beings. Natural farming is a combination of science and philosophy. For the last 50 years, I have called it the Gandhi method. The inspiration for this I received from the teachings of Buddha.

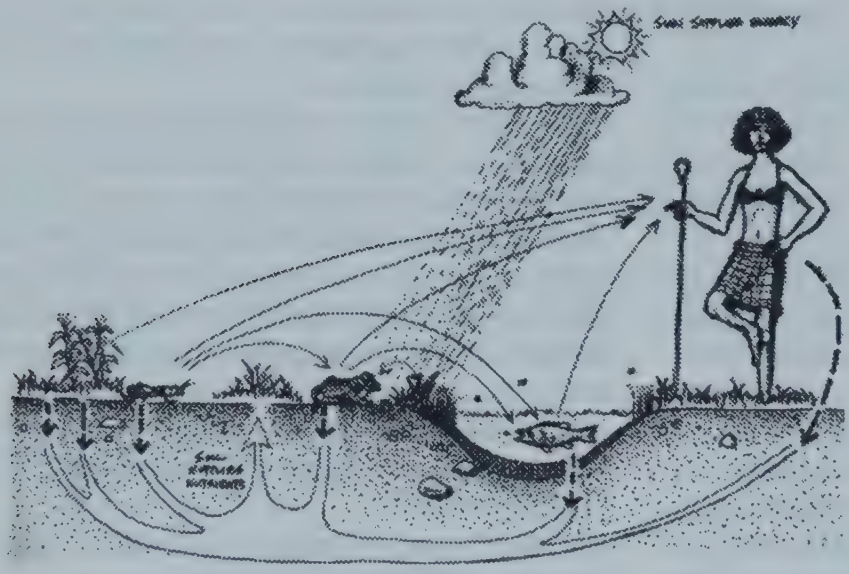
— Masanobu Fukuoka

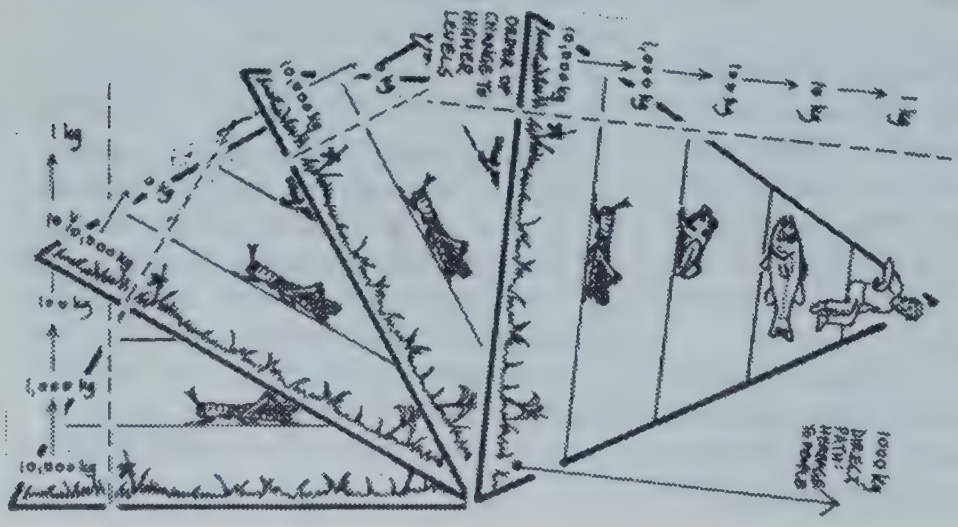
Alternate land-use systems
Intercropping need not just be a mixture of two grain crops. It can also be a mixture of cereals or oilseeds with trees and grasses.

Alternate Systems	Examples
AGROFORESTRY	Leucaena + Sorghum Acacia + Sorghum
AGRIHORTICULTURE	Ber + Cowpea Ber + Sorghum Ber + Castor
SILVIPASTROAL	Leuceana + Cenchrus ciliaris Leucaena + Stylosanthes hamata S.hamata/Sorghum S.hamata/Castor



SORGHUM YIELDS IN AN INTERCROP WITH LEUCAENA





Trophic Pyramid

Life systems are rarely strictly hierachical as in the pyramid structure. Most species are omnivorous and all species recycle valuable waste products to lower levels of the trophic ladder.
Thus life systems are a web or cyclic systems rather than a pyramid.
Source : Permaculture, Bill Mollison

Nature Smiles in Bhaskar Save's Orchard

(A very high-yielding and profitable natural orchard, developed without chemical fertilisers, compost or manure)

We came across an amazing farmer who believes that:

- farming should be done without tilling,
- Weeds and grasses are blessings, not enemies.
- We must co-operate with nature and her myriad plants and organisms, not attempt to control nature through mechanized, inorganic methods.
- Trees require very little nutrient inputs. They need care and observation, not chemical fertilizers and pesticides.

This farmer practices what he preaches. The luxuriant greenery that we witnessed, the dark soft soil teeming with earthworms and micro-organisms, the sheer number and quality of fruits on the trees--all proclaim that this orchard is something special. We understand that he also earns a good income from.

Situated in Dehri village, near Umergaon (Gujarat), Shri Bhaskar Save's orchard has about 700 trees of chikoo and, coconut standing on 7 acres of land. Interspersed among these, are a number of banana trees, papayas, subabuls and several other leguminous varieties. However, to a first time visitor, it is the coconut trees that appear most extraordinary. Fifteen year old palms display clusters of 200 to 300 coconuts under the crowns of these towering trees.

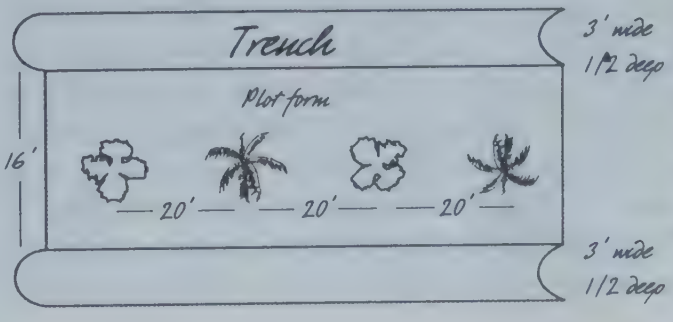
Bhaskarbhai was a primary school teacher before he took to farming. When asked by visitors how he learnt his methods of horticulture, he is quick to reply "My University is my farm". And indeed, he has learnt far more from his experience and sharp observation than he has from scholarly books.

Narrating his experience, Shri Save said, "Initially I used to grow short life-span crops like paddy and vegetables. But after factories started sprouting in the GIDC complex of Umergaon, farm workers became scarce and expensive to hire. The vagaries of the market place further added to our woes. Once, I spent Rs.250/00 on coolie, cartage, and rail transport to send a supply of tindora (a type of gourd vegetable) to Ahmedabad. Because of the glut in the vegetable market there, at that time, I received a mere Rs.27/- for the whole lot ! Thereafter, I started concentrating on horticulture, growing trees like coconut (life span 100 to 125 years) and chikoo (life span 400 to 500 years)."

Bhaskarbhai realised quite early in his farming life that modern, inorganic methods and also some traditional practices like tilling the land were both harmful to the soil and a blatant aggression on the various plant forms and micro-organisms that live in it. He felt and believed that such violence on the land could only beget suffering all around.

He says: "I do not remove weeds. I consider them a blessing, not a problem. They do not hinder the trees in any way, but rather help in their growth. Under the green carpet of the weeds and grasses, you can find roots stretching from the trunks of the trees, and millions of micro-organisms teeming around the tips of little root projections. Such micro-organisms and roots only function under the cover of darkness. They need moisture and aeration, and all those benefits are conferred by the weeds and grasses that clothe the surface of the earth, as their roots till the soil. The weeds further check soil erosion, provide humus, and the leguminous varieties amongst them greatly enhance soil fertility by fixing atmospheric nitrogen in the soil."

"For the last ten years, I have not tilled the orchard. You will also notice that I do not water at the tree trunks. In the 'Platform and Trench method' of irrigation I follow, the large trees(like coconut and chikoo) stand at the centre of the platform which are about 16 feet wide in the case of trees which are at least 4-5 years old. On either side of the platform are trenches which are about 3' wide and 1.5 ft deep. The downward slope along the length of the trench is about 1.5 ft. for 100 feet as one moves away from the point where water is introduced into the trench (This facilitates the flow of water through gravity).



The trenches on either side of the platform are filled with dead leaves and branches from the orchard. This heavy mulching ensures better moisture retention for longer periods. The roots of the various trees and plants on the platform reach up to the trenches and draw on this moisture according to their needs. With such efficient absorption of moisture, there is 30 to 40% saving in the water used for irrigation. Each platform receives moisture from two trenches, one on either side. If in the first 15 days of a month, water is released into a trench on one side of the platform, then in the next 15 days, there is one release of water in the trench on the other side of the platform. In summer months, care must be taken that the trenches remain damp. And in the monsoons, proper drainage is necessary, for if the trenches remain flooded for more than 8 days, the roots of the trees will begin to rot, and this will affect the fruit yields.

Talking about the role of earthworms on his orchard, Bhaskarji says: " There is a gentleman in Pune by the name of Narayan Rao who does farming with the help of earth-worm cultivation. I have learnt that if the soil is damp and soft, then earthworms appear. The presence of organic matter undergoing decomposition is also an attraction for them. These earthworms work ceaselessly. Each earthworm digs soil equivalent to one and a half times its weight every day. If in one acre, there are one lakh earthworms, their weight would be about one ton and they would till soil weighing 1.5 tons. Each night, an earthworm comes up six to seven time to release its excreta on the surface of the soil .

In the process it leaves 14 holes (tunnels) in the soil and also enriches its nitrogen, phosphate and potash content. You can thus see how earthworms greatly help in the work of my farm. If chemicals and mechanical methods of tilling are not used, it is possible to have a population of 3 to 4 lakh earthworms per acre."

Just as weeds and earthworms play an important role in the orchard, similarly the mulch of leaves and twigs added in the trenches greatly help in moisture retention and improving the fertility of the soil. Each year, Bhaskarbhai also adds about 15 trolleys of organic garbage from the nearby settlements in Umergaon. This, he explains, helps to replenish the organic matter that goes out of the farm in the form of crop produce.

In economic terms too, Bhaskarbhai's orchard is not a loser in any way. He explains: "A farmer following the chemical approach may earn an income of Rs. 2.5 lakhs against an expenditure of Rs.1.5 lakhs. But if someone earns only Rs.2 lakhs against an expenditure of Rs.50,000/-, he would still be a gainer. In my case, for every rupee I spend, I get an income of ten rupees !"

By way of friendly guidance, Bhaskarbhai says : "It is necessary for a farmer to ask what his trees and plants need. Where ? When? How much ? And in what form? Our work is to plant, observe and take care. But all the real work of nurturing is done by nature and we should not interfere in any way. It is only farming in harmony with nature that holds forth hope for the future for humankind".

- Mahendra Bhatt & Kapil Shah.

*(Extracts translated from **Sanjeev Kheti**, (Gujarati) 123pages, May 87, Published by Manaviya Technology Forum, 9 Sardar Patel Society, Karamsad Road, Vallabh Vidhyanagar, Gujarat 388120.)*

My Visit to Bhaskarbhai's Orchard

I visited Bhaskar Save's farm around May end. I was pleasantly surprised to find that not only does he follow all the basic principles of natural farming (no tilling, no weeding, no chemicals), but he has also incorporated elements of functional design similar to what one would find in a permaculture system. The special arrangement of species has been planned in relation to the irrigation trenches. On the mid-line of the platform (furthest from the trench) are the long life-span trees like coconut and chikoo with long roots stretching upto the irrigation trenches and beyond for drawing whatever moisture they need. Between these big trees and the trenches are the medium life-span trees like bananas and papayas with smaller root systems that still reach their source of moisture. And very close to the edge of the trenches are small trees of sweet neem or curry-patta (commonly used in cooking). Also near the edge of each trench are a few

croton plants. These, Bhaskarbhai explains, help him to judge at a glance whether there is adequate moisture in the soil. It is not necessary to keep a careful record of when water was last released in each trench. If he sees any crotons that have begun to wither, he knows it is time to release water in that trench.

Interspersed on the orchard are a number of subabuls and several other types of leguminous creepers and plants. Occasionally, one stumbles across a mango tree, a jack fruit, jamun, drumstick or a cluster of bamboos. Bhaskarbhai also grows some vegetables, groundnuts, moong dal and paddy. All these however, are on a small-scale, largely for self-consumption, not for sale. Honey is extracted. There are also a few chicken, 2-3 cows and a bull that has grown fat for lack of work.

Almost half the orchard's income is from the sale of coconut saplings for which Bhaskar bhai is widely reputed. In an average year, he sells 15,000 saplings at Rs.12/0 each! The sale of coconuts, chikoo, bananas, papayas and sweet neem brings in most of the balance income.

There are 3 or 4 farm workers on the orchard whose main job is harvesting the fruits and throwing the dead leaves and branches into the irrigation trenches, where the moisture and the earth-worms speed up the decomposition of the mulch and convert it into nutrient-rich humus. No labour is required for picking the coconuts from the trees as Bhaskar bhai prefers to collect them when they naturally fall to the ground.

If one is just starting an orchard planned on the platform and trench method, Baskarbhai suggests a strategy of intercropping to provide yield for the first 3-5 years till the larger trees begin to fruit. Thus, in these early years, more benefit would be obtained from the medium life-span trees like bananas and papaya and short life-span crops like vegetables. Till the vegetation on the trees becomes thick and wide spread, there would be sufficient sunlight falling on the earth to give a good crop of vegetables.

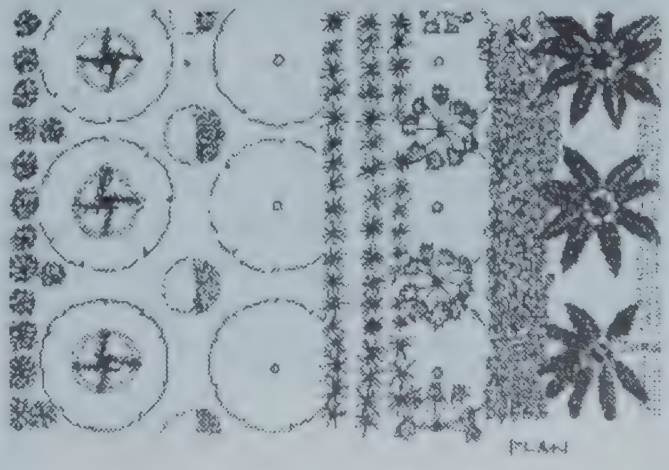
The spread of the root systems of the long life-span tree (coconut, chikoo, mango etc.) would be smaller in the early years. And for this reason, the irrigation trenches should initially be closer than 16 feet apart. This would enable the smaller roots of the young trees to reach their source of moisture. However once such trees become 4 or 5 years old, the distance between adjoining trenches (i.e. the width of the platform) may be kept fixed at 16 or 18 feet. This is quite adequate a gap if one wants to concentrate on horticulture and not grow too many vegetables in the later years when the trees are yielding fruit.

Prominent in Shri Bhaskar Save's Orchard are the numerous signs hung all over (in Gujarati and Marathi), which are very educative for anyone visiting his farm. These signs communicate through brief, pithy statements the philosophy and basic approach to farming that Bhaskarbhai follows.

—Bharat

The Natural Way...

- Natural farming is a path, not a technique.
- Weeds are a blessing, chemical fertilizers an interference in the life of the soil.
- Co-operation is the basic principle of nature.
- The practical philosophy for maintaining environmental balance is : live and let live.
- The life of all plants and creatures is dependent on the condition of the soil. Farming should be done with minimum interference in the ways of nature.
- Nature's tillers are earthworms.
- Inorganic fertilizers are a threat to humus.
- Humus play a vital role in growing tasty and wholesome food.
- Only healthy, living fertilizers can nurture healthy plants.
- Only healthy plants can provide health to humankind.
- Living-soil is the foundation of plant-growth.
- Co-operate with the organisms of the soil.
- Trees do not require much. Just keep the soil alive.
- Trees need moisture, not a great deal of watering.
- Trees are the nectar of the living earth.
- Natural-farming is only possible through compassion.



Tagore Society for Rural Development

Tagore Society for Rural Development in Bolpur (near Shantiniketan), West Bengal, has been conducting some experiments in no-tillage farming since 1986—87. Findings of these were published in three instalments in a Bengali Magazine 'Compass' published by Tagore Society. Dr. Mrinal Kanti Mitra, under whose supervision the experiments were conducted, has given detailed description of the various treatments and their effect on the growth pattern of both crops & weeds. This experiment was conducted during Rabi season with four crops: wheat, barley, lentil and chickpea (Bengal gram)... The detailed data kept and published by Dr. Mitra establishes that with natural farming (no tillage, no fertilizers, no biocides) yields, comparable to or higher than average have been possible.

Consequently, the cost-benefit ratio goes up considerably as there are little or no external inputs. The water requirement also is reduced by 1/2 to 1/4th, depending partly on the soil and natural precipitation. The experiment was to be continued with rice crop along with moong in pre-kharif season ... For further details and for copies of the report in english, published under the title "Natural Agriculture in the Tropics", you may write to:

Dr. M. K Mitra, AA/18, Baguihati, Deshbandhunagar, Calcutta 700 059. or to:

Tagore Society for Rural Development, 14 Khudiram Bose Road, Calcutta - 700 006.

ecological visions

• All my life has been a journey of discovery of the generosity of nature. I started out thinking that we had to do everything ourselves, and of course, we couldn't. But then I discovered that everything will be done for us, provided only that we realise our "nothingness" and thereupon start to search for a way fitting in with the great process of Nature and making the best of them, for our purposes.

—E.F. Schumacher

Our Experience in Natural Farming

We have been farming for the last 5 years. The initial years were a struggle and we made many mistakes. Then we came across Fukuoka's '*One-Straw Revolution*'and ever since, we have been inspired to try his way of Natural Farming.

We gave up chemical fertilizers & pesticides, the 'High Yielding Varieties' of seeds and tried to reduce tillage wherever possible. Crop rotation & mixed cropping were adopted, and we planted a variety of useful trees, particularly drought-resistant species.

Grains:

The abandoning of chemicals & H.Y.V.'s proved a beneficial experience. Our yield almost equalled that of neighbouring farmers. Soyabean yield was more, but 'Chana' (gram) was less. In the absence of pesticides, biological control was visible. Even without ploughing, Soyabean & Jowar grew well outgrowing grass. 'Arhar' had slow growth initially, but later grew taller than grass. Arhar sends its roots deep into the soil and binds it well against any erosive forces. We found that if, after harvesting, we allow the roots to remain in the soil, then in the following year, when rains come, the crop grows rapidly and gives a rich yield. However, in the case of groundnut, chana, wheat and rice, some ploughing seemed necessary.

The plants we found most suitable for re-generating the land were soyabean and arhar. This is because their leaves fall to earth at the time of harvest, and thus enhance soil fertility. We also found that crop rotation helps to re-generate the soil and decrease the incidence of diseases.

Fodder:

Our tree-farming plot, which we have not tilled for over 2 years, is now full of various types of grasses. These include some which are good fodder. e.g. Dinanath, Barbada, Shewri.

Vegetables:

In 1987, we tried sowing seeds of various vegetables (mainly gourds) among the grasses growing under the shade of trees. We got a good harvest, and were encouraged to continue this experiment of growing vegetables without tilling the soil. (Some vegetables, however, did not grow well, apparently for lack of water and perhaps, insufficient sunlight).

Fruits:

On a 2 acre plot, we had planted papaya, amrut, anar (pomegranate), coconut, chickoo, mango and a few other species. These were watered by drip-irrigation. We are presently getting enough fruit for our own consumption.

Cows:

We have both 'deshi' (indigenous) and hybrid varieties. The deshi cows are more disease-resistant, and well adapted to our conditions. The hybrids are disease-prone and require more attention.

House:

We have built our own mud-house, the walls and floors of which are plastered with cattle-dung. There is no electricity, but we have gobar-gas (bio-gas) plant which provides fuel for our cooking stoves.

Problems:

For the last 3 years, there has been little rain, and people are faced with the spectre of drought. The orange farmers have been aggravating the situation by drawing too much water from the ground. In the last 2 years, almost 200 tube-wells have been dug in this area (approx. 20 sq. km). The water level is steadily falling, and if this continues, there will be no water even under 300 feet. In such a situation, keeping cattle is a burden, for, there is scarcity of fodder in the whole area.

Communication through Cultural activities:

Initially, when we came here, people in the neighbourhood were suspicious. Some thought we were mad! However, we have gradually been able to reach out to them through discussions, puppet shows, drama etc. Now, it seems, people are beginning to understand that the problems we face are due to the misdeeds of man, rather than fate or the cruelty of nature. In this lies hope that we may be able to correct our situation, and look forward to a brighter future.

by Vasant & Karuna

(extracts from a 6-pg. report in Hindi printed over a year ago)

Letter from Shri P. D. Baphna

I am a horticulturist, growing mainly sapota (chikoo). I also have mango trees, coconut palms, custard apples (sitaphal), some straw berries, falsa, cherry and a few lichi trees.

In the early sixties, I was using very high doses of chemical fertilizers and insecticides. For 10 to 12 years, the yield was very good, but after 12 years, the yield began to decline. Within 3-4 years, some big trees of sapota died and the rest were on the way of dying. The plantation became very weak and infected with various diseases and the yield deteriorated very sharply. Then I approached Konkan Krishi University, whose specialists suggested various insecticides and other treatments. I tried these for about 2 years, but the plantation did not improve.

Then I thought of leaving it to nature and stopped giving chemical fertilizers and insecticides in 1979. In a way I was compelled to shift to this method.

It took 3-4 years to revive the plantation and now, since 1984, the whole plantation is very healthy. My yield has increased and the quality of the fruits has also improved.

The earthworm population has also increased. It is the earthworm that conditions the soil. I do not grow any cereals. I started drip irrigation system in my farm in a big way in 1980, using low cost technology.

I am happy to know that you are bringing out a magazine on Natural Farming soon. I would like to subscribe to it. If any more information is required by you, please do write to me without any hesitation.

Yours sincerely
P.Baphna

Editor's Note:

Shri Baphna's farm in Dahanu (Maharashtra) is approximately 55 acres in size and employs about 25 farm workers. 90 - 95% of the trees are sapota (chikoo). In a radius of about 1.5 meters around each tree, the ground is thickly mulched with leaves and other organic matter from the farm. External inputs like cow manure have been dispensed with. But about 4-5 kgs. of 'ayurvedic fertilizer' or 'organic soil conditioner', bought from outside, is added around each tree every year. This is apparently a mix of herbal and plant matter. Shri Baphna explained that by the drip-irrigation method, water absorption is more efficient, giving better growth while conserving water. (Drip-irrigation is however not suitable to all soils.) A number of subabul trees are also being planted to help retain the health of the soil by fixing nitrogen.

KASTURBA GRAM KRISHI KSHETRA is spread over 100 hectare cultivable land, 46 hectare silvi-pastural, 26 hectare agro-forestry and horticultural programme with tropical fruit plants of various identified varieties. 150 indigenous Gir cattle-heads produce 100 tonnes of cow-milk and 450 tonnes of organic manure. There is recycling of farm, home and animal wastes with slurry flowing out from the sixteen year old Bio-gas Plant of 2500 cft. size. 500 tonnes of food grains, pulses, fodder and oil-seeds are produced every year. Krishi Kshetra practises biological control of pests, applies 50 to 80% organic manure–farm yard manure, neem-cake, bone-meal and green manure. The Energy complex with photo-voltaic pumps, solar hot-water systems, solar community television, solar cookers of family, community and parabolic types, wind-mills, bio-gas plants, efficient smokeless wood-burning stoves (chulahs), energy-plantation, and exhibitions on environment and ecology are the most attractive recent introductions in Kasturbagram. It continues to train farmers, arrange fairs, camps, workshops, seminars and conferences and publishes brochures, folders and leaflets on agriculture and allied subjects under its Extension Education Programme. It also helps research workers.

- extract from 'Agriculture Policy' published by Kasturbagram Krishi Kshetra.

There are a variety of types of agriculture which are generally considered sustainable: organic, biological, biodynamic, ecological, natural, permaculture, regenerative, and alternative. While there are distinctions between each, they are all attempts to blend the best aspects of both traditional and modern agriculture. They have utilized a fundamental understanding of nature, as well as the latest scientific advances, to create integrated, self-reliant, resource-conserving agricultural systems that are productive in the short and long terms.

It is toward the goal of sustainable agriculture that the International Alliance is dedicated. We wish to further a transition from that flickering match represented by modern chemical agriculture and move toward brilliant fields of green that directly utilize the energy of the sun - an agriculture that can meet our needs, both now and in the future.

- extract from a resource paper 'Agriculture Policy', published by Kasturbagram Krishi Kshetra.

F.A.R.M. : Dr. Shirin Gadhia's way

If one wants to farm as an action therapy for physical, emotional, social or environmental ailments, then according to Dr. Shirin Gadhia, one must F.A.R.M. This means 'Farming with Appropriate Resource Management'. Its approach defines very well the essence of most good work done in different sustainable agriculture practices.

Dr. Gadhia's F.A.R.M. concept incorporates the following:

1. Mazibuko Deep Trench for vegetables, herbs, fodder and perhaps a few cash crops.
2. No-till strategy of Fukuoka, in which earthworms act as nature's ploughs.
3. Agro-forestry to include trees which serve the following purposes: provide fruits, fodder, fuel, fibre, medicine, and also serve as living fence.
4. Sensible agricultural practices such as mulching, green manuring, biological nitrogen-fixation through legumes, also biological & integrated crop protection through the use of tulsi, neem, garlic, wood ash, cow's urine.
5. Integrated animal husbandry methods, where animals, bigger than chicken or ducks are kept in stalls (unless the land is very big and animals few). Fodder is grown on nearby trenches, and animals are fed by a cut-and-carry system instead of free grazing. The dung collected in the stables can be used in the trenches and in bio-gas plants.

Mazibuko Deep Trench :

Prepare the trench as illustrated next page, just before (or just after) the first showers. It will soak up water like a sponge. You can start planting immediately (beginning with leguminous varieties) and feel assured that there will be no need to re-dig that trench for 60 years. Adopt mixed cropping with a multi-storey 'stacking'of plants, and integrate with the other practices suggested above.

The initial investment for digging and filling trenches is rather high at the rate of Rs. 10/- per cubic metre. However, it is suitable for intensive gardening in small plots, and confers a number of important advantages:

1. no irrigation required.
2. prevents soil erosion
3. improves soil fertility
4. No chemical fertilizers or pesticides required
5. No weeding required
6. No ploughing required
7. Enjoy increased & improved outputs with less & less inputs. You can reasonably expect 'bumper yields' from the 3rd year onwards.

Other advantages:

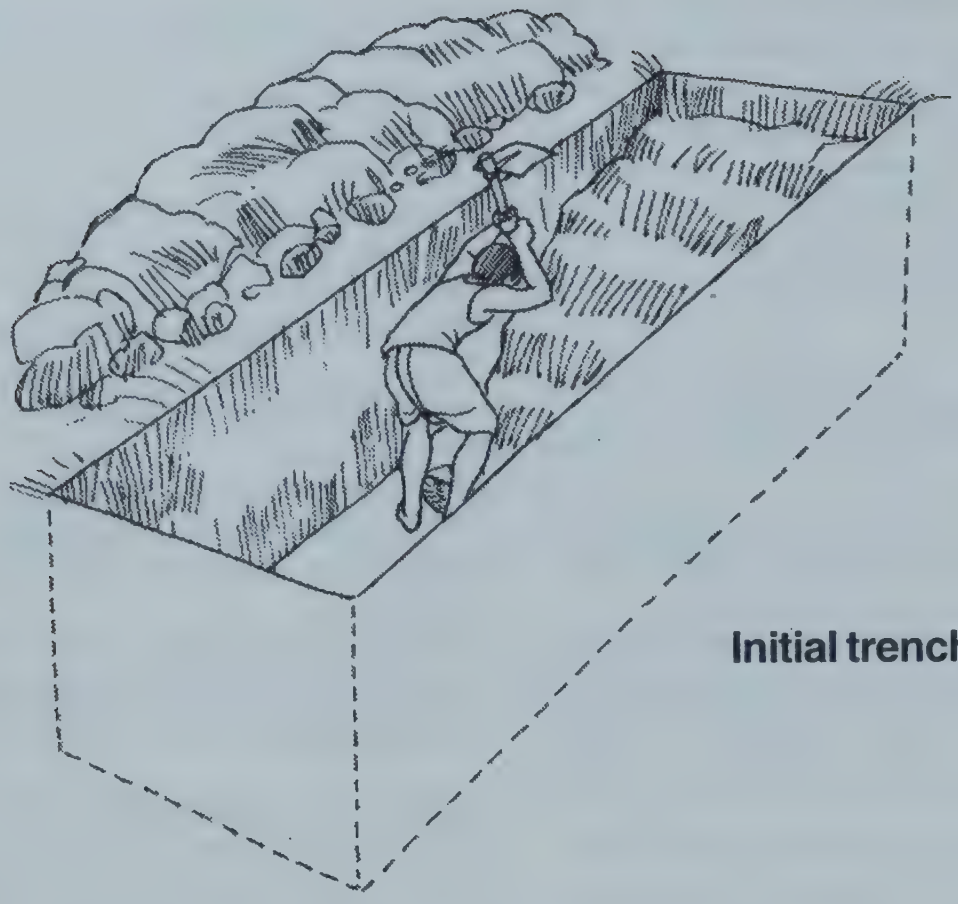
- Improved drainage (no water logging)
- Therefore removes breeding ground of mosquitoes, and checks diseases like malaria, filariasis, etc.
- re-charges ground water.
- cleans up the environment by acting as an organic garbage disposal / re-cycling system.

Note : The above guidelines & observations have been extracted and edited from the notes of Dr. Shirin Gadhia. After living & working in Germany for a no. of years, she and her husband, Deepak Gadhia (who works with alternative renewable energy sources) have settled near Valsad in the late '80s. Shirin has recently started teaching a few tribal families the F.A.R.M. approach to sustainable agriculture. She will also be working with some children of a local school, and experimenting with them the Deep Trench method of kitchen gardening.

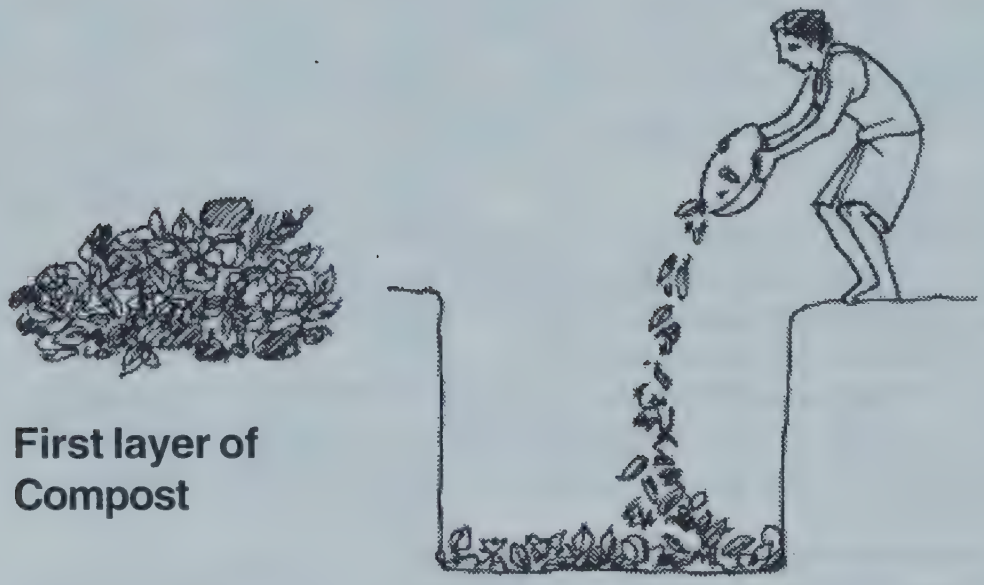
The other area in which Dr. Shirin Gadhia is deeply involved is domestic water conservation through efficient use & re-cycling. She believes in communicating through example and herself uses less than 3 buckets a day (which also takes care of washing utensils and clothes). With large parts of Gujarat being drought-prone, there is growing interest in the one-woman awareness campaign she has started with the help of a series of posters she has made on the subject.

International Symposium on Natural Resource Management for a Sustainable Agriculture, 6-10 February 1990, New Delhi.
For more information contact : Dr. R.P. Singh, Organising Secretary & Director, Central Research Institute for Dryland Farming Hyderabad 500 659

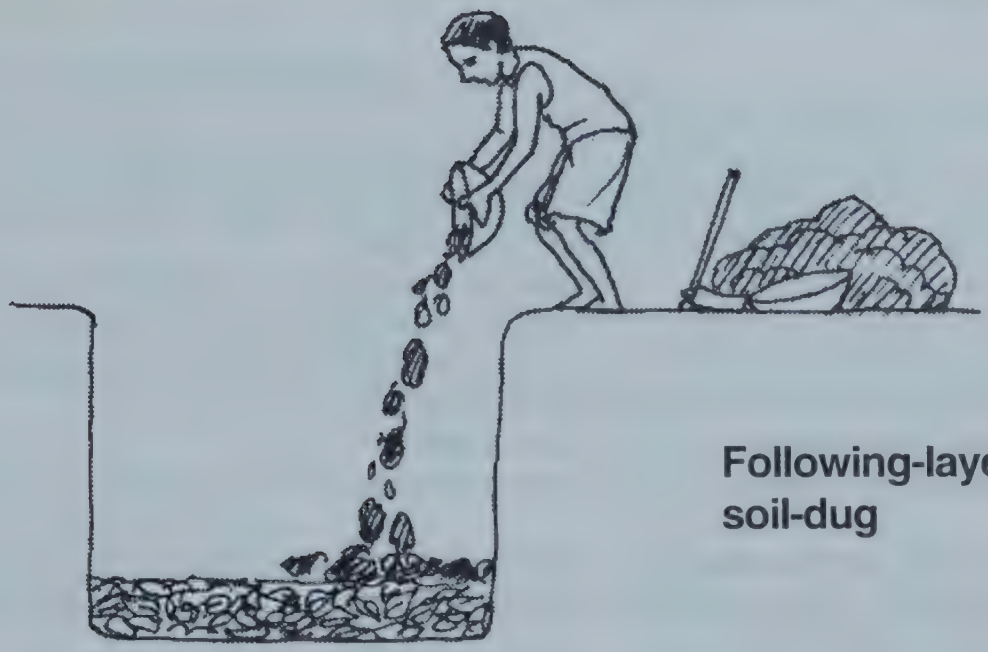
Steps in arriving at the Mazibuko Deep Trench



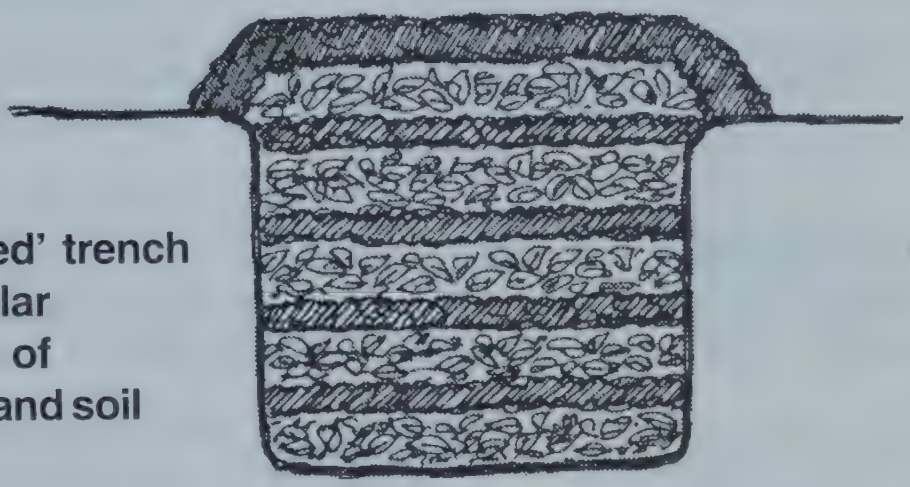
Initial trench



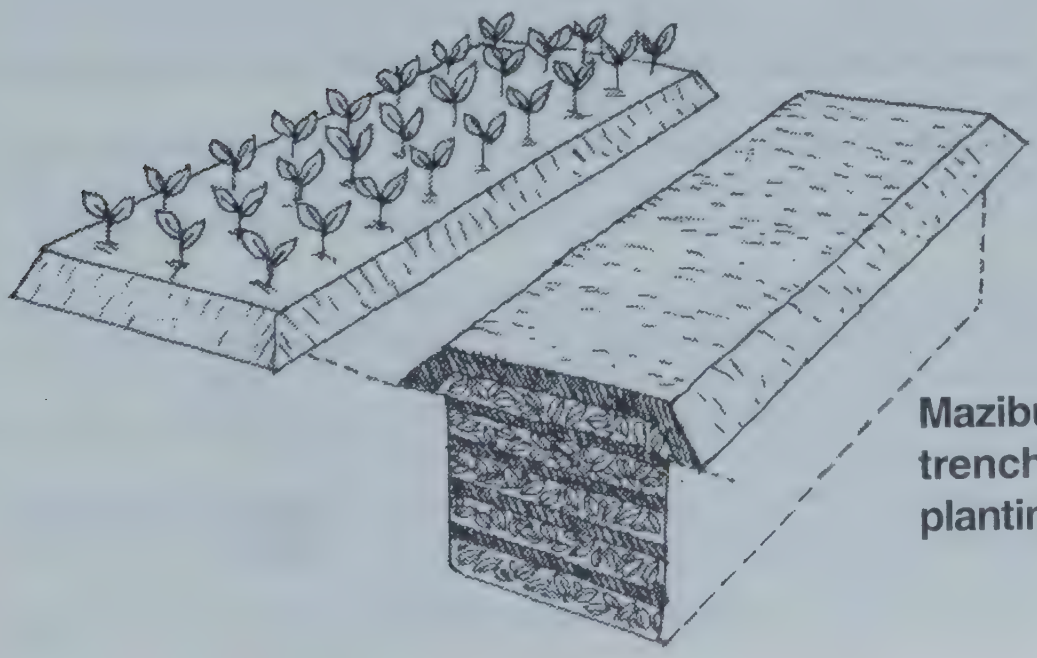
First layer of Compost



Following-layer of soil-dug



'Completed' trench after similar additions of compost and soil layers



Mazibuko deep trench ready for planting

Forest Farming with Ramanathan

Ramanathan does forest farming and offers consultancy to anyone desiring to start a forest farm. He also organises occasional natural living treks and learning camps.

Forest farming, as he practices, is a blend of Pioneer, Primary, Secondary and Main species at a density of 1500 or more plants per acre. A large number of varieties-food, fodder, fuel, fibre, foliage, medicinal & aromatic plants, creepers and shrubs are planted together to complement each other.

As the plants mature, the system soon becomes 'self-watering' and 'self-manuring'. It starts yielding from the fifth year onwards. The total yield and asset value is considerably more than in annual and seasonal crops. Ramanathan feels that five acres is a good-sized area to do forest farming. More than 10 acres is not easy to plant in one season, and is also difficult for an individual farmer to maintain.

At a consultancy fee of Rs.150/- per acre, the following is undertaken :

1. Site assessment and species recommendation, 2. procurement assistance for seeds & seedlings, 3. planting supervision.

The farmer has to do the following : 1. live fencing, 2. bunding 3. pitting 4. planting 5. guarding and if possible, watering. All this, for the first three years, is estimated to cost between Rs. 3,000/- to Rs. 6,000/- per acre. There after, it is only watch & ward and gather the produce.

Ramanathan adds that July to December is the ideal planting time for peninsular India. Accordingly water has to be scheduled to provide seedlings that are 3 to 4 months, or even one year old.

C.R. Ramanathan may be contacted at :
Ganapathipalayam Post, Udumalpet Taluk, Tamil Nadu - 642 122

Glorialand

(Organic agriculture and dairy at Sri Aurobindo Ashram's farm in Pondicherry : extracts from a report in A.M.E. documentation for training courses)

How can we treat the earth as a mere tool toward which we have no obligation? The use of chemicals destroys the wonderful balance and harmony with the cosmos. If man wants to live in harmony with the cosmos, he must not infringe the laws of nature.

The Gloria Farm, spread over 100 acres (40 hectares), was bought by the Ashram in 1963. Agriculture was started here in 1966. For the first few years, chemical fertilisers and pesticides were used. But it was becoming apparent that these were harming the land. The decisive turning point came in 1971, when the Mother intervened and refused to drink a glass of juice from tomatoes treated with pesticides.

Thereafter, pesticides were abandoned, and agricultural operations gradually changed to the organic way. At present, compost, organic mulch, green manure (pulses & other legumes), and the slurry from biogas plants are used as fertilisers. The health of the soil is viewed as most important, and this is therefore the central focus of attention.

The dairy is an integral part of Gloria Farm. There are approximately 250 cattle, which are mostly Indian pedigrees. Foreign breeds and cross breeds are more disease prone. None of the animals are vaccinated, as vaccination goes against the laws of nature.

The cows are not allowed to roam about in the fields for grazing. Since their food is brought to them, there is no risk to the earth from the trampling of cow hooves.

The total milk production at present is 650 litres per day. About 500 kgs. of cowdung are manually deposited every day in 3 biogas domes. The urine is drained into a huge reservoir, where it is diluted and then pumped to the biogas domes to be added to the dung.

Approximately 30 acres of the land is for rice production. This acreage includes some land for forage, pulses

and a few cereals like millet. Yields averaging at 6 to 7.5 tons per hectare per crop are recorded for paddy production. The total annual rice production is about 150 tons. Out of this, the Ashram itself needs 200 kgs. every day for its members and guests.
The banana trees yield 5000 bananas per day.There are also many coconut trees, and to a lesser extent, mango and papaya. A number of vegetables are grown, and the beehives provide honey.
Gloria Farm is making special efforts to promote research on growing native breeds with the use of biological, low tillage mulching techniques. Separate plots are set aside for such experimentation. The results so far have been very encouraging.

Prakruti

(Nature)
"Rajiv", 4th Floor
62O Jame Jamshed Road,
Dadar (East),Bombay 400 014

Prakruti is an organisation for the promotion of natural living and an environmentally sustainable society. It was formed in 1988 and is now a Regd. Society and Public Trust with members and sympathisers spread throughout Maharashtra and Gujarat. We are also building bridges with people in other parts of the country who, in their own way, share the philosophy of living in harmony with nature.

Natural living is not possible without naturally grown food that is free of toxic chemicals. It is thus inseparable from natural farming and other ecologically sustainable approaches for meeting our food needs. These include permaculture, wormiculture, organic farming and similar strategies for agro/social forestry and tree farming. All these have a shared aversion to chemical fertilizers and pesticides and some also avoid or minimise tilling and weeding.

Prakruti thus endeavours to bring together people who have a shared interest in various aspects of natural living and natural farming. We hope to make available naturally/organically grown foods (cereals, fruits and vegetables) to more people.

Prakruti is also concerned with the proper use of natural 'resources'. This includes water management & conservation, rainwater harvesting, strategies for using renewable sources of energy, soil regeneration, afforestation and appropriate technologies for human needs.

Prakruti is deeply concerned with health, education, and culture.

Prakruti hopes to spread awareness and exploration of ecological alternatives. For this purpose, we are trying to develop an information network, including a library and resource-centre for mutual consultation and co-operation, among people sharing this broad philosophy.

We welcome you to join us.

Yours sincerely,
Kisan Mehta
(President, **Prakruti**)

Proposal for a Network on Ecological Agriculture

(Natural Farming, Organic Farming, Bio-dynamic Farming, Permaculture, Biological Farming, etc.)

Purpose: To share information, seeds, ideas etc.; to enable collective experiments, and generally to keep in touch.
For whom : Any individual engaged in agriculture (in the broad sense i.e. including aquaculture, silviculture, animal husbandry, etc.) can participate in the Network (No institutional membership). Network members are required to contribute towards the cost of publication of a newsletter — min. 3 issues a year and postage. (Suggested Contribution : Rs. 45 per year). Network members should send at least two reports a year about their work. They should also be prepared to reply within a reasonable time when any other Network member sends in a query.
As soon as we have 30 positive responses to this proposal (*made in 1989*), we shall start this network. So, if you intend joining, don't wait! Write NOW to Ardhendu S. Chatterjee, c/o. Isaiambalam School, Kottakarai, P.O. Irumbai, Auroville, Tamil Nadu - 605 101.

S.E.E.D. Network

('Seed Exchange Education & Dissemination' : soliciting your response for initiating an informal network (*in 1989*) among planters for the wider propagation of useful indigenous species and information about these).

1. i) Whether you would like to join such a network?
   ii) Any suggestions on how best to organise such a network. e.g. qualifying responsibilities of members & coordinator; essential modalities of functioning, etc.

2 i) List some of the more important/useful species growing in your farm/region (eg. varieties useful for regenerating the land, edible, medicinal and any other uses/functions; if hardy, and can grow well without much special care).
   ii) Apart from the local name if you know the botanical name or the name in any other language, please list these too.

3. i) Name at least three varieties of seeds you can offer to other members of the S.E.E.D Network.
   ii) What are the special features/functions/uses of these species?
   iii) Whether any particular climatic or soil conditions are necessary/suitable for their growth?
   iv) Any preferable time/season for planting?
   v) Any special planting instructions?
   vi) Any companion plants with which these species grow well?
   vii) Irrigation needs?

4 i) Are the seeds available with you in small quantities, or abundant supply?
   ii) Whether any price charged for supply of larger quantities? (For supplying less than 100 or 200 grams of any variety to any member, this should preferably be free, apart from postal costs, if any).
   iii) Any other places you know where these varieties may be available in abundant quantities?

5. i) Are there any special seeds that you are looking for to plant yourself?
   ii) Any information you need about particular species?

No information about the S.E.E.D. network is available with the Development Research Communication and Services Centre (DRCSC) at present. However, the questions are quite pertinent to be addressed even now and DRCSC would be interested to have your queries and responses to these questions...

Seed Exchange News

(Refer Network List for addresses)

The groups which are associated with the Sustainable Agriculture Network of DRCSC in West Bengal have created their own seed banks—some of them without and some with monetary aid. The groups practise sharing within and between them. The groups with monetary aid, in order to repay their aid (which would go in for the formation of other seed banks), charge for their surplus seeds. The seed banks are supposed to primarily serve the local needs of the groups. The possibility of sharing would depend on the availability and can be co-ordinated by DRCSC. The network addresses could further aid the availability of seeds in other States in India.

Birbhum Project Area

1. Daranda Chasi Group, Daranda
2. Dhultikuri Adibasi Group, Dhultikuri
3. Kashiara Chasi Group, Kashiara
4. Mohutar Sabuj Sangha Krishak Dal, Mohutar.
5. Chasimangal Dal, Gopta
6. Tiltikuri Chasi Group, Tiltikuri
7. Dakshin Durgapur Tekshoi Chasir Dal, Dakshin Durgapur
8. Krishi Pragati Group, Dhobanda.
9. Prayas, Kenduli

Kajla Project Area

1. Bibekananda Beej Bhandar

2. Ishwar Chandra Vidhasagar Krishak Dal, Chaitanyapur.
3. Mahatma Gandhi Krishak Dal, Dholmari.
4. Sabujer Abijhan Beej Bhandar, Dakshin Sarada (Village)
5. Uttar Cherpur Tekshoi Krishak Dal, Uttar Cherpur.

Kukhrajore Project Area

1. Banagram Krishi Unayan Samiti, Banagram
2. Ma Sarada Mahila Samiti, Kukhrajore Village.

Malda Project Area

Suryamukhi Mahilaa Dal, Kanatola, Malda (SSUP)

Purulia Project Area

Dehri Para Group, Dehri Para

One way of classifying the seeds available would be in terms of information about their sowing season. But this classification (preserving the alphabetical order within each season & done with the help of the field team of DRCSC) is by no means the only way. The name within brackets indicates the vernacular Bengali name and the information about variety, if available.

Pre-Kharif

Dal

Green Gram [Mung (Sonali, Green)]

Fruit Vegetable

Bitter Gourd (Korola)
Khero (like cucumbur)
Snake Gourd (Chichinga)
White Jute [Nalte (Mitapat)
White Mulberry [Futi (Deshi)]

Green Manure

Legume (Dhanchya)

Oil Seed

Ground Nut [Chena Badam (JL 24)]

Tuber

Cocoyam/Daseen/Eddo/Taro (Kachu)

Late Pre-Kharif

Green Manure

Sunhemp (Shon)

Tuber

Ginger (Aada)
Tapioca (Kasava)

Kharif

Bean

Barbati [Vigna sp.(Lafa, Dofosali)]

Cereal

Common or Proso Millet, Hog Millet [Cheena]
Kodo Millet (Kodo)
Maraoa
Paddy [Dhan (Kejhor Chori, Dakshin Kalma, Bhasha Manik, Narasingha Jata, Kalo Jera, Mughi, Bhuri, Rupshal, Gobinda Bhog, Badsa Bhog, Juggal, Chaopakushi , Chamar mondi, Tikapatni, Sitasal, Cheoa, Boudulali, Saliabore, Sabita, Patnai, Bonkanta, Banskanta, Dudheswar, Latisal, Basmati, Butia, Kakuria)]
Pearl Millet/Spiked Millet (Bajra)

Dal

Congo Pea/ Pigeon Pea/ Red Gram [Arhar (White, Vegetable, Nadia, Upash)]
Horse Gram (Kulathi Kalai)
Roma Kalai

Fruit Vegetable

Cucumbur [Shasha]
Red Sorrel / Roselle [Tak Dharonsh(Kudrum)]
Ridge Gourd [Jinga (Patol Jinga, Thupi, Lamba, Shera)]
Velvet Bean (Tarukala)

Leafy Vegetable

Indian Spinach (Pui)

Tuber

Elephant Foot Yam/ Giant Taro [Ole (Kabhur, Deshi)]
Mango Ginger (Aam aada)
Turmeric (Halud)

Late Kharif

Dal

Black Gram [Biuli (Barshati, Chaitali, Deshi)]
Grass Pea (Kheshari)

Rabi

Bean

Bean (Creeper, Bush)
Broad Bean, Field Bean (Bakla)

Cereal

Barley (Jab/Jau)
Wheat [Gom (Sonalika)]

Dal

Bengal Gram/Chick Pea/Gram [Chhola (Deshi, Gesho motor)]
Lentil (Mushur Dal)
Rajma
Sweet Pea [Motter (Arkel, Rachna)]

Fruit Vegetable

Spinach [Palang (Sweet)]
Tomato (Deshi)

Leafy Vegetable
Chinese Spinach/Joseph's Coat/ Tampala/ Vegetable Amarnath (Marish/Ponka/Note)
Khosla (Sak)
Piring, Kasturi Methi (Trigonella sp.)

Oil Seed
Linseed (Tishi)
Mustard [Rai Sarisha (B 9, Jhanti, Thori, Black, Yellow)]
Niger (Sirguja)
Oilseed (Kusum)

Spice
Ajowan [Jowan]
Black Caraway (Kala Jira)
Chandani (Spice)
Cumin [Jira]
Fennel [Mauri]
Fenugreek (Mathi)
Garlic (Rashun)
Onion (Peyanj)

Tuber
Potato [(Gol Alu, Susni Alu, Kham alu)]
Radish (Mula)

Pre-Kharif + Kharif
Fruit Vegetable
Lady's Finger [Dharonsh (Green, Red)]
Pointed Gourd (Patol)
Red Pumpkin [Kumro (Bibi, Sweet)]

Leafy Vegetable
Swamp Cabbage (Danga Kalmi)

Pre-Kharif + Rabi
Dal
Soya Bean (Soybean)

Fruit Vegetable
Bitter Gourd (Ucche)
Leafy Vegetable
Vegetable Amaranth (Note Sak)

Spice
Coriander (Dhone)

Pre-Kharif + Kharif + Rabi
Leafy Vegetable
Punka (Notae)
Pulia (Notae)

Pre-Kharif + Late Kharif
Oilseed
Sesame [Til (Red, Black, White)]

Kharif + Late Kharif
Dal
Kulti (White, Black (deshi))

Kharif + Rabi
Bean
Common Cowpea [Barbati (Lafa)]

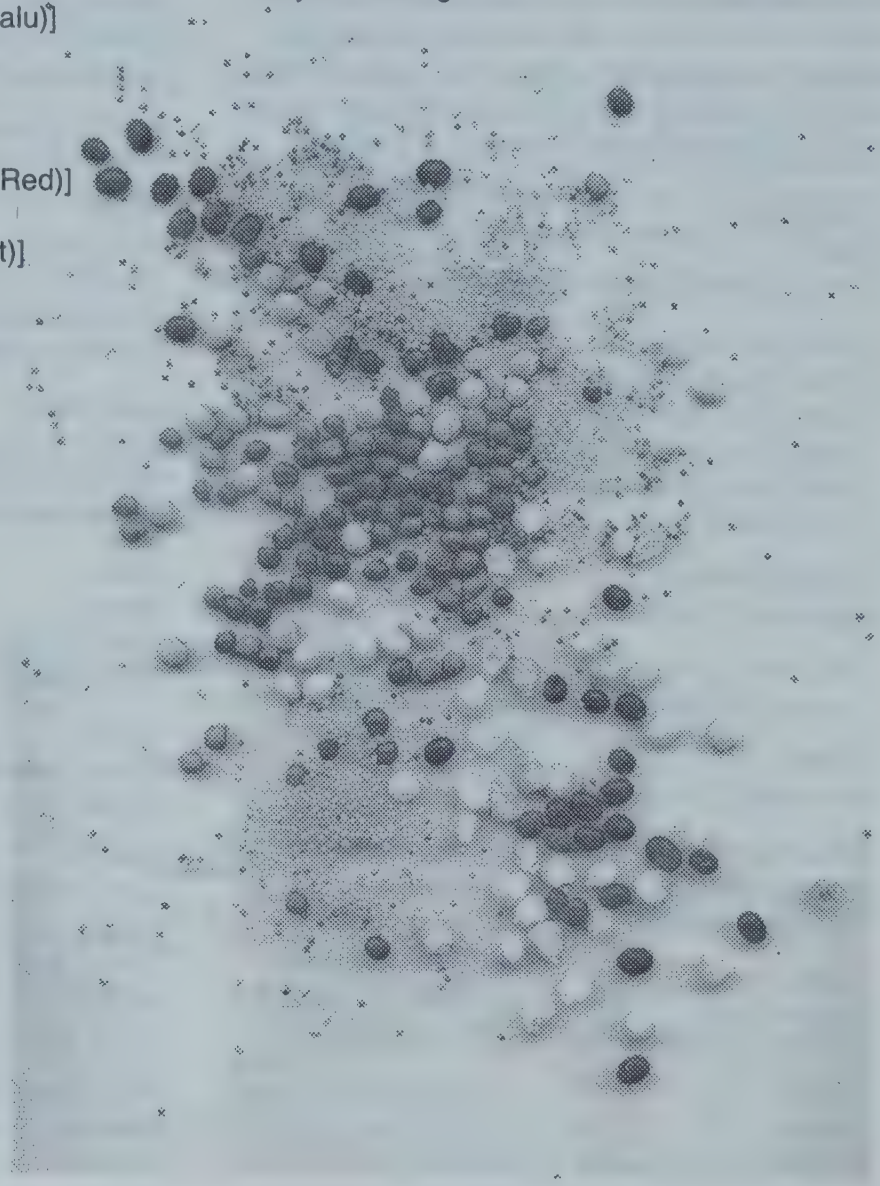
Cereal
Maize/Corn (Bhutta/Joar)

Oil Seed
Sunflower (Surjamukhi)

Late Kharif + Rabi
Fruit Vegetable
Lablab bean, Hyacinth Bean, Indian Butter Bean, Bonavist [Sim (Kamranga, Makun)]

All Seasons
Fruit Vegetable
Brinjal [Begun (Tarachandi, Electric, Kanta, Black, Gol)]
Chilli [Lanka (Harin Ghata, Kul, Suryamuki, Dhani, Bullet)]

Leafy Vegetable
Garden Spinach [Palang (Sour)]
Panjabi Palang



A NET-WORKING GUIDE FOR ECOLOGICAL AGRICULTURE

This was the most difficult part in the attempt to reprint--to trace the changes undergone by people who were inc luded for sustainable agriculture in 1989. Our attempt had been informed by two of the key persons in the networking process in 1989--Ardhendu S. Chatterjee & Bharat Mansata. We have also taken the help of Claude Alvares ed.,(1996) *The Organic Farming Source Book*, The Other India Press & Third World Network. Some of the addresses which were included in the 1989 edition and couldn't be verified have been left in italic type case.

This list is by no means complete. Bernard at Auroville; AME, Bangalore; Earthcare Books, Calcutta; DRCSC, Calcutta can supplement with more names and addresses. *The Organic Farming Sourcebook (1996)* can further aid networking.

EASTERN

ASSAM

1. Loken Warie,
   Runikhata High School, P.O. Runikhata, Kokrajhar District, Assam - 783 373.
   (Does Organic Farming and is venturing into Natural Farming and Permaculture Design)

BANGLADESH

2. Shimpei Murakami,
   Proshika, Central Training Centre, G.P.O. Box 3149, Dhaka, Bangladesh.
   (Experimenting with and teaching ecological agriculture. Has written a book on natural farming. Now in Japan)

BIHAR

3. Society for Rural Industrialisation,
   Bairatu, Ranchi 834 009, Bihar.
   (ASVIN programme: sustainable land use and production systems for small farmers, particularly adivasis)

WEST BENGAL

4. Ardhendu S. Chatterjee,
   Development Research Communication and Services Centre, 57 A Dharmotola Road, Bosepukur, Kasba, Calcutta 700 042.
   (He has returned to Service Centre in Calcutta after working as trainer, technical advisor, programme co-ordinator in Allahabad Agricultural Institute, U.P.; Village Action Group & Auroville Greenwork Resource Centre, Tamil Nadu and Japan International Volunteer Centre in Cambodia. He is involved in Trainers' Training & some design work in organic farming)
5. Ashok Ghosh,
   Bikas Kendra, Village Aatghara Via Koisur, Machlandapur, North-24 Parganas, West Bengal.
   (Has been doing Natural Farming from late 80s. Accompanied Fukuoka during his one month visit to India in January, 1988.)
6. Bharat Mansata,
   10 Middleton Street Calcutta - 700 071
   (Doing Organic Farming & forest regeneration in Maharashtra. Authoring a book on Natural Farming to be published soon. Earthcare Books, at the above address run by Vinita Mansata, is also a resource centre for books on issues of ecology, organic farming etc.)
7. Mrinal Kanti Mitra(Dr.),
   AA-18, Deshbandu Nagar, Baguihati,
   Calcutta - 700 059.
   (Agricultural Scientist, interested in Natural Farming. Has written the book 'Natural Farming in the Tropics' which is a report of the experiences of Tagore Society for Rural Development at Bolpur)
8. Saiji Makino (Prof.),
   No. 11, Andrews Palli, Santiniketan,
   West Bengal - 731 235.
   (Has visited Fukoka's farm. Not directly involved now in organic farming. Maintains links with several tree planting efforts around Birbhum)
9. Shyamal De,
   Paribesh Chetana, 102, Seth Bagan Road,
   Dum Dum, Calcutta 700 030
   (Advocacy and mobilisation of local people around environmental problems. Alternative farming near Birbhum)
10. Society for Equitable Voluntary Actions (SEVA),
    3 C Milan Apartment, 52/3 Vidyatan Sarani,
    Calcutta 700 035, West Bengal.
    (Under Vikas Kendra, (Agriculture Extension Centre) experimenting organic farming)
11. Tagore Society for Rural Development,
    14, Khudiram Bose Road, Calcutta - 700 006.
    (The Tagore Society coordinated Fukuoka's visit to India in 1988. It has also been doing experiments in Natural Farming at Bolpur (Near Shantiniketan) for the last 7 years. Shri Pannalal Dasgupta who was the irrepressible, octogenarian president of the Society in 1989 has recently expired.)

WESTERN

GUJARAT

12. Bhaskar Save,
    Kalpavriksha Vadi, Village Dehri, Via Umergaon, Valsad District, Gujarat - 396 190
    (Has successfully developed a high-yielding, naturally grown orchard - no tilling, no weeding, no chemicals, no compost)

13. Korah Mathen,
D-1, Aurobindo Society,
Near Vastrapur Talavdi, Ahmedabad - 380 015
(Secretary of Samvardhan-Association for Propagation of Indigenous Genetic Resources)
14. Sajiv Kheti Farm,
Vinoba Ashram, Gotri, Vadodara,
District Vadodara 390 021, Gujarat.
(natural farming in the farm of Nature Cure Centre)
15. Self Employed Women's Association (S.E.W.A.),
Seva Reception Centre (opp. Victoria Garden),
Ahmedabad - 380 001
(Involved in social forestry and helping women start small kitchen gardens. Manju Raju was the contact person in 1989.).
16. Shirin D. Gadhia(Dr.),
Plot No.86, GIDC Gundlav Phase I, Valsad - 396 035, Gujarat
(Is helping villagers set up kitchen gardens; practices and teaches water conservation, and does information networking for Prakruti. Dr Shirin and Deepak Gadhia are co-editors of IFOAM Asia Newsletter. In the 90s they were in the process of starting an ecology centre called International Centre for Networking Ecology, Education and Reintegration)

MAHARASHTRA

17. P. D. Baphna,
Horticulturist, Dahanu, Thane District 401 601, Maharastra.
(Doing Organic Horticulture)
18. ***Centre of Science for Villages, Wardha - 442 001, Maharastra.***
(Active in promoting alternative,appropriate technologies. Brings out a newsletter / magazine)
19. Darshan Shankar/Rajeev Khedkar,,
Academy of Development Science, Kashele, Kariat Taluka, District Raigad, Maharashtra 410 201
(ADS has developed a community gene bank for traditional rice varieties, has a collection of ethno-medical plants to be found in the Western Ghats which are supplied to community health organisations, institutions and individuals.)
20. Deepak Suchde,
Shri Gramjyoti, 7/C Mandar Jyot,
Thane Naka Road,
Panvel 410 206, Maharashtra.
(Organic Farmer)
21. Leslie Nazareth,
ASIA PLATEAU, Panchgani 412 805 (MAH.)
(Is interested in pursuing natural farming & permaculture. Attended the permaculture workshop in Hyderabad 1987. Now in Bombay.)
22. *Ms. Kavita Mukhi,*
13B, Maker Tower, Haribhal Estate, Colaba, Bombay - 400014.
(Teaching Natural Diet and Nature Cure; used to run an organic food shop)
23. Pandaripande (NADEP Kaka),
Dr. Kumarappa Gobar Kendra, Pusad 445 204, Maharashtra.
(Developed the NADEP composting method more effective than normal method)
24. People's Education & Development Organisation,
Village Moda, Durgapur District 314 001, Rajasthan.
(Doing Social Forestry on a low budget with active participation of local people. Working with adivasi women in organic vegetable cultivation)
25. SAMVAD,
At Rawala, Taluka Warud,
District Amravati 444 907, Maharashtra.
(Contact Persons: Karuna and Vasant Futane. Doing Natural Farming from the 80s)
26. Shiv Narayan Adhao,
Coordinator, Rishi Kheti Prakalpa Jagar Society,
At & Post Shendurjana Ghat, Tehsil Warud,
District Amravati 444 907, Maharashtra.
(Formerly with Friends Rural Centre. From late 80s doing Natural Farming Independently)
27. Vasant Palshikar,
Parisar, 150 Gangapuri, Near Ghatge Patil Transport, Wai 412 803.
(Parisar had hosted a conference on Natural Farming in 1988, where a number of participants from Western & Central India had gathered)
28. *Wenin Pereira,*
Anusandhan, 79, Carter Road, Bandra Bombay - 400 054.
(Expired a few years ago. Author of many books on ecology. Was doing Organic Farming. Centre is now shifted to Nasik under the care of Subhash Sub)

NORTHERN

NEPAL

29. Institute for Sustainable Agriculture Nepal (INSAN),
GPO Box 3033, Kathmandu, Nepal.
(Secretary - Badri Dahal)
30. M. C. Pereira, Ward No. 1, Sharadanagar,
Rampur P.O., Chitaman District, NEPAL.
(Has a permaculture farm. He was in Kampuchea, providing training and consultancy for re-generating the land along permaculture principles. Now works in South India)

NEW DELHI

31. C.A.P.A.R.T, Council for Advancement of People's Action and Rural Technology,
Guru Nanak Foundation Building, New Mehrauli Road,
New Delhi - 110 067
(Brings out a bimonthly magazine 'People's Action'and has an ongoing publication programme for compiling a National Directory on Rural Technologies).
32. Kalpavriksh,
B 25 Defence Colony, New Delhi 110 024.
C 17 A Munirka, New Delhi 110 067.
33. Navdanya,

A 60 Hauz Khas, New Delhi 110 062.

34. Dr. Santosh Satya,
Centre for Rural Development and Appropriate Technology,
IIT, Hauz Khas, New Delhi 110 016.

UTTAR PRADESH

35. Akhil Bhartiya Samaj Seva Sansthaan (ABSSS), Manikpur and Mau Blocks, Chitrakut District, Uttar Pradesh(*Contact Via Vigyan Siksha Kendra-entry39*)
36. Beej Bachao Andolan,
District Tehri Garhwal, P.O. Nagani 249 175,
Uttar Pradesh.
(Saving indigenous seeds. Contact Person: Vijay Jardhari)
37. Gorakhpur Environmental Action Group,
224 Purdilpur M.G. College Road,
Gorakhpur 273 001, Uttar Pradesh.
(Environmental orientation in schools, rural development and ecological agriculture)
38. Shoor Vir Singh,
Chanda Nagli, Mohanpur Village, Bijnor District,
Uttar Pradesh - 246 726
(Doing Natural Farming from the late '80s)
39. Vigyan Siksha Kendra,
52, Civil Lines, Lajvantika, Banda - 210 001,
Uttar Pradesh.
(Doing experiments in Organic & Natural Farming)

SOUTHERN

ANDHRA PRADESH

40. Aurora, G. S. (Prof.)
245, Salarjang Colony, Hyderabad - 500 008.
Professor of Sociology,
Institute of Social and Economic Change,
Nagarbhavi, Bangalore 560 072, Karnataka.
(Was Dean of the School of Humanities, Hyderabad University. Doing roof-top gardening by sheet mulch method of Permaculture)
41. Deccan Development Society,
A6 Meera Apartments, Basheerbagh,
Hyderabad 500 029, Andhra Pradesh.
(involved in the introduction of organic farming in Anna District through training and demostration, lectures and meetings)
42. Raghu Rao,
13 Srinagar Colony, Hyderabad 500 873.
(Attended the permaculture workshop conducted by Bill Mollison in 1987. An M.S. in Ecology started working a farm along the principles of permaculture design. Was working in DFID, Delhi for last 10 years. Planning to get back to Organic Farming)
43. Timbaktu Collective,
Chennekothapalli Village, Anantapur
District 515 101, Andhra Pradesh.
(there are 45,000 trees of 46 indigenous species in the second worst drought affected district in the country)
44. Venkat
117, East Marredpalli, Secunderabad,
Andhra Pradesh - 500 026.
(A retired doctor, who designed the demonstration site in Deccan Development Society at Pashtapur in Zaheerabad Taluk of Medak District, A.P. Now lives in Hyderabad and works along with Narsanna & others. He still collects and distributes seeds of many crops and trees, especially for dry land areas.)

KARNATAKA

45. *J. P. Pereira,*
Kirehully Estate, Sundekere (P.0), Hassan District, Karnataka - 573 134.
(Permaculture consultant, researching natural pest control for a Permaculture handbook on the subject. Planning to establish a Permaculture Institute & training centre in India.)
46. Agriculture Man Ecology (A.M.E.),
368 4th cross, J.P.Nagar, 3rd Phase,
Bangalore 560 078, Karnataka.
(Conducts training courses in Ecological Agriculture for extension workers. Has an excellent reference library.)
47. T. S. Ananthu,
A 4 Whitefield Villa, Whitefield,
Bangalore 560 066, Karnataka.
(Farm: Navadarshanam, Gumlapuram,
Thally 635 118, Tamil Nadu).
(Co-authored the report on the 'Mohanpur Experiment in Natural Farming'done at the farm of Shoor Vir Singh.)
48. D.D.Bharamagoudra,
At/Post Yellavatti, Taluka Shirahatti,
District Dharwad 582 117, Karnataka.
49. *Dr. Chandrasekhar,*
R.R.S., Handpost, Mudigene, Chikmagalore District, Karnataka - 577 132.
(Agricultural scientist promoting and aiding Natural Farming)
50. L. Narayan Reddy,
Village Sorubanase P.O. Varthur, Bangalore - 560 087.
(Owner and Operator of mid-size organic farm. He was an award-winning state farmer using chemical fertilizers before converting to organic farming in the early '90s. Within two years was again winning state-best-farmer award. One of the pioneers in trying out integrated farm management)
51. Purushottam Rao,
Krishi Nivas,Kuruvalli Post,Thirthahalli Taluka,
Shimoga District 577 432, Karnataka.
52. Vivek & Julie Cariappa,
C/o Post Master Birwal Village (P.0),
Heggada Devanakote, Mysore District,
Karnataka - 571 121.
(Doing Organic Farming from the late '80s)

KERALA

53. *V. S. Chamunni,*
Padiniattinpuram, Erirnayur (P.O), Via Alathur, Palghat, Kerala.
(Doing Organic Farming)

54. Fr. Francis Acharya,
Kurishimala Ashram, Vagamon, Kottayam District, Kerala - 685 503.
(Dairy and Organic Farming)

55. John. C. Jacob, Editor, 'Ankh',
Amrutham Home for Harmonious Living,
P.O. Sholapur, Via Agali,
Palakkad Dt. 678 581, Kerala.
(a retired college teacher involved with organic farming. Holds short term courses in organic farming, vedanta and harmonious living as well as camps on natural education. Editor of 'Ankh' a monthly magazine in Malayalam dedicated to conservation education - has network throughout Kerala)

56. P. K. Kurien,
Malanadu Development Society, Kanjirapally,
Kerala - 686 507.
(Planning to set up an ecological farm)

57. SARANG,
Agali-Chittoor P.O., Palakkad 678 581, Kerala.
Contact Persons: Gopalkrishnan & Vijayalaksmi
(Sarang is basically an alternative school and has natural farming as one of its activities from '80s.)

58. K.T.Thomas Kuruvinakunnel,
Idamattom P.O., Bharananganam,
Kottayam District 686 588, Kerala.
(Organic Farmer)

59. University of Agricultural Sciences,
Gandhi Krishi Vigyan Kendra Campus,
Bangalore 560 065.

TAMIL NADU

60. Annapurna,
Bharat Nivas Post, Auroville 605 101,
Tamil Nadu.
(tries to produce enough grain, pulses and oil seeds to supply the needs of Auroville)

61. Revelation Farm,
Auroville - 605 101 Tamil Nadu.
(There are several experimental farms, forests and botanical gardens in Auroville. Bernard, still in Auroville and active but in a different farm. Involved both in eco-farming and seed gathering. Thomas in 'Annapurna', Charlie in 'Aurogreen', Amrit in 'Verite' are other organic farmers.)

62. Centre for Indian Knowledge Systems (CIKS),
No.2, 25th East Street,Thiruvanmiyur,
Madras 600 041.
(explores the relevance and application of various aspects of traditional knowledge system particularly science and technologies. This is the present contact address of Dr.Vijayalakshmi)

63. Green Works Resource Centre,
C/o Isaiambalam School Kottakaral, P.O. Irumbai,
Auroville, Tamil Nadu - 605 101.
(Engaged in promoting afforestation of village wastelands, providing training to N.G.O.workers, mainly from South India. It can provide limited quantities of seeds on an exchange basis or for research work.)

64. Daisy Dharmaraj,
C/o. PREPARE,
4 Sathalvar Street, Mugappair (W), Madras 600 058.
(Promotes & networks Afforestation & ecol. agri. groups)

65. Ganapathy,
Sakthi Farm,Veerapathy, Puliyur Post, Kulathur Taluka, Pudukottai District 622 504, Tamil Nadu
(Integrated farm)

66. Gloria Land,
Sri Aurbindo Ashram, Pondicherry 605 002
Tamil Nadu.
(mainly rice-banana-napier grass-cow integrated farming with large biodigesters and some ducks, fish, multipurpose trees added. Shri Manindra Pal was a farmer, looking after Sri Aurobindo Ashram's 'Gloria Land' Farm of 40 hectares (100 acres) from the late '60s, cultivated under organic manuring and having a dairy of 250 milch cows.)

67. Lok Swasthya Parampara Samvardhan Samithi,
P.O. Pathanjalipuri, Thadagam,
Coimbatore 641 008, Tamil Nadu
(Network of groups engaged in research on Alternative Science & Technology in the area of health. They have published 'Local Health Traditions, 95 pages, Rs 25/-

68. Kollingi Farm,
Kudumbam, Ezhil Nagar, Keeranur,
Pudukottai District 622 502, Tamil Nadu.
(Established in 1992. A training centre for NGOs and farmers in organic farming)

69. Kudumbam,
7 Ezhil Nagar, Keeranur via Pudukottai 622 502,
Tamil Nadu.
(Kudumbam was a voluntary organisation interested insocial forestry. Later its emphasis shifted to organic farming. G.Nammalwar was associated with it.)

70. A.M.M.Murugappa Chettiar Research Centre,
Tharamani, Madras 600 113, Tamil Nadu.
(Research Centre in appropriate technology. They have done several experiments with farmers on French Bio-Organic method of growing Vegetables. Dr. Sultan Ahmed Ismail who was earlier with the New College is now in MCRC)

71. Panneer Selvam,
Kalupatti, Peramboor Post, Mathur I E Via,
Pudukottai District 622 515, Tamil Nadu.

72. Fr. Paul Vellakinnathu,
Gudalore Farmers Association, Marthomanagar Gudalore, Nilgiris 643 250.
(Organic farming)

73. PPST Foundation (People-oriented Science & Technology),
29 Fourth Main Road, Gandhinagar, Adyar,
Madras 600 020

(PPST consists of a small group of academicians engaged in research on traditional science & technology)

74. Pondicherry Science Forum,
9 Perumal Koil Street,
Vinayaga Garden, Pondicherry 605 008.

75. C. R. Ramanathan,
Biorama Trust,Ganapathipalayam Post,
Udumalpet Taluk,Tamil Nadu - 641 122.
(Doing Forest Farming and providing consultancy & starting assistance. Occasionally organises natural living treks & learning camps.)

76. Research Centre for Ecology, Agriculture and Community Development,
Flower Cottage, Koottamavilai, Vanniyur P.O.,
Kuzhithurai, Kanyakumari District 629 163,
Tamil Nadu.
(to popularise eco-farming in the villages around)

77. *E. R. Sadasivarn,*
Elur Post, Coimbatore, Tamil Nadu - 641 032
(Forest farmer)

78. Tamil Nadu Agricultural University,
Coimbatore 641 003.

79. Traditional Agricultural Produce Producers Association/Traditional Seed Bank,
1/109 Raja Street, Valayampattu Village, Chengam,
T.S.District 606 701, Tamil Nadu.
(Contact Persons: Arivudi Nambi and K.Venkatachalam)

CENTRAL

MADHYA PRADESH

80. Friends Rural Centre,
Rasulia, Hoshangabad, Madhya Pradesh - 461 001.
(Comprises a 45-acre complex set aside 25 acres for Organic Farming, 2 1/2 acres for Natural Farming. Published the Indian edition of 'One Straw Revolution' by Fukuoka.)

81. Jacob Nellithanam,
C/o. Shyam Borade, Sarvodaya Shikshan Samiti,
Village Maachla, PO Kasturbagram,
Indore 452 020, Madhya Pradesh.
(Seed networking, paddy seed growing in Chattisgarh under guidance of Dr.Riccharia.)

82. Kasturbagram Krishi Kshetra,
P.O. Kasturbagram, Indore 452 020,
Madhya Pradesh.
(Spread over 100 hectares of cultivable land, Kasturbagram has been practising organic farming from 1980s)

83. Rakesh Diwan,
Kasera Mohalla, Hoshangabad,
Madhya Pradesh - 461 001.
(Networking / Journalism on Development Issues)

84. Raju & Shalini Titus,
Titus Farm House, Bhopal Road, Hoshangabad,
Madhya Pradesh - 461 001.
(Doing Natural Farming from the late '80s. They have inspired by example several other people to try natural farming.)

85. *Dr. R. H. Richharia,*
'Jaishree', B-1, Punjabi Bagh, Govindapura, Bhopal, Madhya Pradesh - 462 023.
(Agricultural scientist, did farming and raised rice clones — Ex. Director, Central Rice Research Institute, Cuttack & M.P. Rice Research Institute, Raipur. Expired)

86. Shyam Bahadur Namra,
Ankur Farm, Post Jamudi, Anuppur,
District Shahdol 484 224, Madhya Pradesh.

87. VIKALP,
Bansalpura, Kesla Post,
District Hohangabad 461 111, Madhya Pradesh.
(Vikalp was started by Krishna Kumar and Lorry Benjamin both of whom worked at Rasulia with Pratap Aggarwal on Rishi Kheti and now run their own farm and training centre)

Others

88. Agrecol Development Information,
C/o Oekozentrum Langenbruck,
CH-4438 Kangenbruck, Switzerland.
(Agrecol is an information centre within the network for sustainable agriculture, in 'Third World'countries)

89. Ifoam General Secretariat,
C/o Bernward Geier, Nord Bahnhofstr-1A,
D-3430, Wit Zenhausen, West Germany.
(IFOAM — International Federation of Organic Agriculture Movements)

90. Information Centre On Low-External Input Agriculture(ILEIA), P.O. Box 64, 3830 AB Leusden, The Netherlands.

91. Permaculture Institute,
P.O. Box I Tyalgum,N.S.W. 2484 Australia
(May be contacted for publications on permaculture. *International Permaculture Journal* published by the institute works at 113, Enmore Raod, Enmore - 2042, New South Wales, Australia.)

Dangerous Decibels

Constant exposure to high volume sounds could cause hearing impairment, even premature deafness. This warning was sounded by Peter Plath, West German ENT specialist. At noise levels exceeding 85 decibels, health damage is definite, slowing down heartbeat volume and stomach movements, raising the rate of breathing, increasing blood pressure and muscular tension and causing the pupils to dilate.

The ubiquitous Walkman, car and home video systems, transistors, TV sets, discotheques are high risk areas. Discotheque noise levels, frequently over 100 decibels, or nearly as loud as a jet aircraft 500 meters overhead, can be tolerated for no more than two hours a week. Yelling at the top of one's voice measures 110 decibels, a freight train 90, normal conversation 55, a whisper 30. The damage is evident when high frequency sounds are no longer audible, gradually nudging the hearing threshold up the scale. Five hundred school-children in West Germany, tested for listening defects, were discovered to have lost the capacity to hear upto seven decibels — sounds of soft breathing or rustling leaves. 4,000 teenagers tested in Berlin were declared to suffer from ringing and whistling in their ears, indicating inner ear damage.

Are not Indians, young and old, exposed to similar health risks? For, are we not a nation which revels in noise? Car horns, loudspeakers blaring at public functions and festivals, urbanites showing off their stereo systems...

Do the warnings about noise pollution fall on deaf ears?

— *Mirror*, June 89.

Engineering Boob-oo (oops!)

"Despite many potential dangers, genetic engineering has become the fastest growing industry in the world and is hailed as the technology of the 21st century"

"... Genetic engineering has been used to manipulate cows to give more milk by administering growth hormones. Dr. Mira Shiva, coordinator of the All-India Drug Action Network, recalls the calamity in the 70s in the U.S. when cows were given human growth hormones to produce more milk. The animals grew to such huge sizes that they could not bear their own weight. The milk they gave had less nutrients. And men who consumed it suddenly began developing breasts as a result of estrogen administered to cows."

— Saroj Iyer
(*Times of India*, 31-7-89)

The Great Deluge

Global warming as a result of the green-house effect caused by high concentrations of carbon dioxide and other gases could lead to the melting of the ice-caps and a rise in sea level. By present trends, many cities and other coastal areas will be flooded in less than 40 years.

All over the world, and particularly in industrialised nations, there is urgent need to reduce the burning of fossil fuels (petrol, diesel, coal etc.), and concentrate instead on renewable energy sources.

— World Commission on Environment and Development, 1987.

• All of us in Africa are slowly waking up to the fact that the African crisis is essentially an environmental problem that has precipitated such adverse symptoms as drought, famine, desertification, environmental refugees, political instability, widespread poverty etc..

We are awakening to the fact that if Africa is dying, it is because her environment has been plundered, over-exploited, and neglected.

Many of us in Africa are also waking up to the realization that no good samaritans will cross the seas to come to save the African environment. Only we Africans can and should be sufficiently sensitive to the well being of our environment."

— Mrs. Rahab W. Mwatha,
The Greenbelt Movement

• "How did so many smart people come to forget that money was meant to be an aid for living, and not this

life for making money.

It seems that as people grow older, they dust the most important questions under the carpet and forget the greatest pleasures in life. They talk of our "youthful inexperience" and "foolish idealism". But to me, their maturity is mere conformism, bought at the frightful price of killing that which is dearest to the mind and heart."

— A page in the college-days-diary of *Abhoy Kolhatkar.*

• Plant a tree and watch it grow. It's an indescribable experience.
– Anna Dylan

• Is it convenient that nature, which gave birth to this amazing body and brain, could have forgotten to provide a self-healing capability ? What we call 'disease symptoms' (fever, cold, diarrhoea, ...) are often curative measures of the body to resist and eliminate toxic substances. By suppressing the symptoms, we may be aggravating a deeper problem. All that is really required is to stop oppressing the body, and it naturally heals itself. The attitude of the mind is half the victory, or half the defeat.

— Venuswara

• It is said that truth is often eclipsed but never extinguished.
– Titus Livius Livy

• When the forms of an old culture are dying, the new culture is created by a few who are not afraid to be insecure.
– Rudolph Bahro

• The earth can provide for everyone's need, but not enough for everyone's greed.

— Mahatma Gandhi

• Where is the life we have lost in living?
Where is the wisdom we have lost in knowledge?
Where is the knowledge we have lost in information?
The cycle of heaven in twenty centuries
Has brought us farther from God
And nearer to the dust.

— *T.S. Eliot*

"We ordered mussels, not DDT, PCB, petroleum, plutonium and lead."
Cartoon by Nikki Meith.

The Sun and the Energy Plants

Most of the energy available to us can be traced back to the sun. The food we eat derives its energy through photosynthesis by plants. The fossil fuels that run our machines are but the stores of concentrated solar energy obtained via organic matter buried for hundreds or thousands of years. In the span of a single generation, we are using up the stored reserves of many lifetimes before us. If we want a nature that sustains our children and their children, we should stop wastage. The only way before us is to plant, plant and plant.

I.R. – Stop Polluting, Start Re-cycling !

Anyone travelling by the Indian Railways in the past few years will have noticed a marked increase in the use of disposable aluminium foil packets and plastic glasses for serving food, tea and coffee.

Both aluminium and plastic are non-biodegradable and end up polluting the country-side. The plastic glasses are specifically marked "crush after use". It is perhaps in the interest of the manufacturer that these are not washed and re-used by poor urchins who willingly collect any they can find.

The Indian Railways probably can not be bothered about such a "trivial matter" like polluting the environment. But if this is not true, they can consider providing in each carriage a fixed bin lined with a thin plastic bag for collecting and suitable re-cycling of the disposed aluminium & plastic.

Aluminium is an excellent reflector and conductor, and can be easily re-cycled for making low-cost solar heaters/ovens. The primary manufacture of aluminium requires very high energy inputs. It is therefore a double shame that aluminium is wasted only to pollute after brief use. In a situation of fuel scarcity, and the mounting crisis of deforestation, solar cookers would be a greatly welcomed gift from the Railways.

Can the Centre of Science for Villages or CAPART or any other individual/group prepare a proto-type solar cooker from re-cycled aluminium foil? Perhaps the I.R. engineers too can try their hand at such non-conventional but useful technology.

The safety of the bio-sphere is directly related to recycling. If garbage and night-soil are not composted and used to build humus, these will continue to be drained into the rivers to silt them up and fill them with germs, thus damaging aquatic life, reducing oxygen level in water and endangering man's own existence. Composting is one way of utilising the human wastes. "Not only will composting kill many disease-bacteria, but, it ultimately delivers the nitrogen and phosphorus in the waste to the soil in the most usable form for plants". Rodale says that in composating the formula is "10 parts plant matter to 1 part human waste, as the nightsoil is particularly rich".

Some prefer that the human wastes should be treated in the gobar gas plants, their gas taken out for use as fuel and the slurry used as manure. It is possible that this form of treatment and use is better than composting.

– S.N. Ghosh

Towards a Lonely Planet

Unwittingly for the most part, but right around the world, we are eliminating the panoply of life. We elbow species off the planet, we deny room to entire communities of nature, we domesticate the Earth. With growing energy and ingenuity, we surpass ourselves time and again in our efforts to exert dominion over fowl of the air and fish of the sea.

We do all this in the name of human advancement. Yet instead of making better use of lands we have already put to over-use, we proclaim our need to expand into every last corner of the Earth. Our response to natural environments has changed little for thousands of years. We dig them up, we poison them in order to mould them to our image. We homogenize the globe.

Eventually we may achieve our aim, by eliminating every "competitor" for living space on the crowded earth. When the last creature has been accounted for, we shall have made ourselves masters of all creation. We shall look around, and we shall see nothing but each other. Alone at last.

• I saw him as belonging to that select tribe of creative yea-saying men who are stubbornly holding the pass until the rest of us come to our senses and decide what we want to live for, and with what and how.

— Lawrence Durrell (from 'The Plant Magic Man')

• Truth and beauty are in the eyes of the beholder. The eye sees what the 'I' sees. If you hold anything an inch from your face, that is all you will see, and not too clearly. Similarly, those pre-occupied with the 'I' have no space in their vision for the stark realities and the great wonders of nature. The miserable ego pervades all perception till radical metamorphosis or death.

— anon

• An individual human existence should be like a river - small at first; narrowly contained within its banks, and rushing passionately, past boulders and over waterfalls. Gradually the river grows wider, the banks recede, the waters flow more quietly, and in the end, without any visible break, they become merged in the sea, and painlessly lose their individual being. The man who, in old age, can see life this way, will not suffer from the fear of death, since the things he cares for will continue.

— Bertrand Russell

Marx , a Green?

The worker can create nothing without nature, without the sensuous, external world. It is the material on which his labor is manifested, in which it is active, from which and by means of which it produces.

—From '*Economic and Philosophic Manuscripts*'

All progress in capitalist agriculture is progress in the art, not only of robbing the labourer, but of robbing the soil. — From '*Das Kapital*'

"Of course, if Marxists were to face the ecological evidence honestly, they would be forced to conclude that Socialist societies have not done much better. Their environmental impact is diminished only by their lower consumption, which in any case they are trying to increase. The subtleties in Marx's organic thinking are inconvenient for most social activists who prefer to organize around simpler issues. Maybe this is why Marx declared at the end of his life, 'I am not a Marxist'."

— Hazel Henderson

Applied Ecology

The principles of functional design of landscapes :

• Everything is connected to everything else.
• Every function is supported by many elements.
• Every element should serve many functions.

— Permaculture Notes.

Money Mess

Money is a resource only if it is in the right amount at the right place and at the right time (and therefore meets a real need). Otherwise, it is a pollutant."

— Source Unknown

Oikos + logos → oecologie → ecology

• '**Ecology**': derived from the Greek 'oikos' which means house or habitat and 'logos' which means understanding. The term 'oecologie' was coined by the German, Ernst Haeckel in 1870 and thereafter incorporated into English as 'ecology'.

'Ecology' (eekoloji): Study of relations of organisms to their environment; study of ecosystems; study of the environmental conditions of existence; the art of housekeeping.

An End to Birth?

We are in an unprecedented era of extinctions calculated to be running at upto 400 times the natural rate. By the end of this century, it is estimated, we could lose one million species as a result of indiscriminate human exploitation. This would be the greatest biological debacle experienced since life began. It will massively exceed the "great dying" 65 million years ago, when a sizeable share of the earth's species–including the dinosaurs and their kin–disappeared.

Extinction has always been a way of life on earth. But death is one thing, an end to birth is something else. – The Gaia Atlas

• Of the estimated 80,000 edible plants, only about 150 have been cultivated on a large scale, and less than 20 provide 90 percent of our food. Many precious wild and semi-domesticated varieties are disappearing.

The conservation and propagation of our species heritage is the key to a viable future. The way before us is to plant, plant and plant.

– Seeds and Food Security.

Fight Lead, NOW!

Lead poisoning can cause motor nerve paralysis, kidney disease, mental retardation, ... The organo-lead compounds added to petrol are 300 to 400 times more toxic than inorganic lead compounds. These are spewed into the air from the exhausts of automobiles. The lead concentration of 6.63 micrograms per cubic metre in the air of Calcutta is the highest in the world.

Our mindless acceptance of this insidious poison reduces to a tragic farce our great concern about the schooling and medicare of our children. Can any thing be done to avoid lead?

By adding 15% methyl alcohol to petrol, the need for adding lead as an anti-knocking agent is obviated. Another strategy is to adopt a package of measures to check the total level of automobile pollution. The third option available to individuals is to abandon the city.

Without vigorous action by citizens - and the government - we are like lambs awaiting the slaughter. Fight lead, NOW!

Steps to an Ecology of Mind

•... The, ideas which dominate our civilization at the present time date in their most virulent form from the Industrial Revolution. They may be summarised as:

(a) It's us against the environment

(b) It's us against other men

(c) It's the individual (or the individual company, or the individual nation) that matters

(d) We can have unilateral control over the environment and must strive for that control

(e) We live in an infinitely expanding "frontier"

(f) Economic determinism is common sense

(g) Technology will do it for us

These ideas are simply proved false by the great but ultimately destructive achievements of our technology in the last 150 years. Likewise they appear to be false under modern ecological theory.

The creature that wins against its environment destroys itself.

... Other attitudes and premises — other systems of human 'values' — have governed man's relation to his environment and his fellow man in other civilizations and at other times.

... In other words, our way is not the only possible human way. It is conceivably changeable.

— Gregory Bateson

(From 'Steps to an Ecology of Mind')

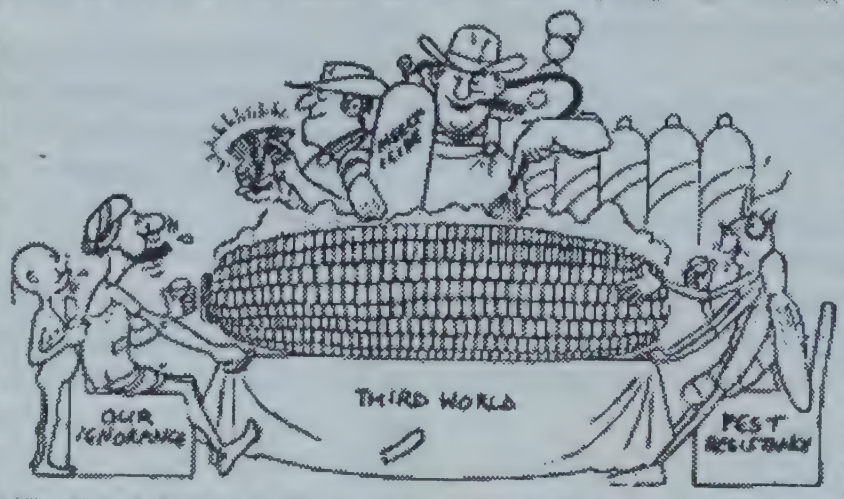
Re-enchantment

To re-discover our dreams, we need to look afresh through the eyes of a child. What do we actually want and why?

By focusing on quality rather than market-place valuations, we might get less entangled in the shadow-symbol pursuit of possessions, positions and power. Clean air, clean water and wholesome food - these are the basics. And then ...

"To play and explore; to communicate and create; to sing and dance; to discover love and rejoice – This is LIVING".

– New Writing on the Wall



In 1854, the "Great White Chief" in Washington made an offer for a large area of Indian land and promised 'reservation' for the Indian people. Chief Seattle's reply, published here in full, has been described as the most beautiful and profound statement on the environment ever made.

How can you buy or sell the sky, the warmth of the land? The idea is strange to us.
If we do not own the freshness of the air and the sparkle of the water, how can you buy them?
Every part of this earth is sacred to my people.
Every shining pine needle, every sandy shore, every mist in the dark woods, every clearing and humming insect is holy in the memory and experience of my people. The sap which courses through the trees carries the memories of the red man.
The white man's dead forget the country of their birth when they go to walk among the stars. Our dead never forget this beautiful earth, for it is the mother of the red man.
We are part of the earth and it is part of us.
The perfumed flowers are ours sisters; the deer, the horse, the great eagle, these are our brothers.
The rocky crests, the juices in the meadows, the body heat of the pony, and man — all belong to the same family.
So, when the Great Chief in Washington sends word that he wishes to buy our land, he asks much of us. The Great Chief sends word he will reserve us a place so that we can live comfortably to ourselves.
He will be our father and we will be his children. So we will consider your offer to buy our land.
But it will not be easy. For this land is sacred to us.
This shining water that moves in the streams and rivers is not just water but the blood of our ancestors.
If we sell you land, you must remember that it is sacred, and you must teach your children that it is sacred and that each ghostly reflection in the clear water of the lakes tells of events and memories in the life of my people.
The water's murmur is the voice of my father's father.
The rivers are our brothers, they quench our thirst. The rivers carry our canoes, and feed our children. If we sell you our land, you must remember, and teach your children, that the rivers are our brothers, and yours, and you must henceforth give the rivers the kindness you would give any brother.
We know that the white man does not understand our ways. One portion of land is the same to him as the next, for he is a stranger who comes in the night and takes from the land whatever he needs.
The earth is not his brother, but his enemy, and when he has conquered it, he moves on.
He leaves his father's graves behind, and he does not care. He kidnaps the earth from his children, and he does not care.
His father's grave, and his children's birthright, are forgotten. He treats his mother, the earth, and his brother, the sky, as things to be bought, plundered, and sold like sheep or bright beads.
His appetite will devour the earth and leave behind only a desert.
I do not know. Our ways are different from your ways.
The sight of your cities pains the eyes of the red man. But perhaps it is because the red man is a savage and does not understand.
There is no quiet place in the white man's cities. No place to hear the unfurling of leaves in spring, or the rustle of an insect's wings. But perhaps it is because I am a savage and do not understand.
The clatter only seems to insult the ears. And what is there to life if a man cannot hear the lonely cry of the whipporwill or the arguments of the frogs around a pond at night? I am a red man and do not understand.
The Indian prefers the soft sound of the wind darting over the face of a pond, and smell of the wind itself, cleaned by a midday rain, of scented with the pinon pine.
The air is precious to the red man, for all things share the same breath—the beast, the tree, the man, they all share the same breath.
The white man does not seem to notice the air he breathes. Like a man dying for many days, he is numb to the stench.
But if we sell you our land, you must remember that the air is precious to us, that the air shares its spirit with all the life

it supports. The wind that gave our grandfather his first breath also receives his last sigh.
And if we sell you our land, you must keep it apart and sacred, as a place where even the white man can go to taste the wind that is sweetened by the meadow's flowers.
So we will consider your offer to buy our land. If we decide to accept, I will make one condition: the white man must treat the beast of this land as his brothers.
I am savage and I do not understand any other way.
I have seen a thousand rotting buffaloes on the prairie, left by the white man who shot them from a passing train.
I am a savage and I do not understand how the smoking iron horse can be more important than the buffalo that we kill only to stay alive.
What is man without the beasts? If all the beasts were gone, man would die from a great loneliness of spirit.
For whatever happens to the beasts, soon happens to man. All things are connected.
You must teach your children that the ground beneath their feet is the ashes of your grandfathers. So that they will respect the land, tell your children that the earth is rich with the lives of our kin.
Teach your children what we have taught our children, that the earth is our mother.
Whatever befalls the earth befalls the sons of the earth. If men spit upon the ground, they spit upon themselves.
This we know, the earth does not belong to man' man belongs to the earth. This we know.
All things are connected like the blood which unites one family. All things are connected.
Whatever befalls the earth befalls the sons of the earth. Man did not weave the web of life: he is merely a strand in it. Whatever he does to the web, he does to himself.
Even the white man, whose God walks and talks with him as friend to friend, cannot be exempt from the common destiny.
We may be brothers after all.
We shall see.
One thing we know, which the white man may one day discover—Our God is the same God.
You may think now that you own Him as you wish to own our land; but you cannot. He is the God of man, and His compassion is equal for the red man and the white.
This earth is precious to Him, and to harm the earth is to heap contempt on its Creator.
The whites too shall pass; perhaps sooner than all other tribes. Contaminate your bed, and you will one night suffocate in your own waste.

But in your perishing you will shine brightly, fired by the strength of the God who brought you to this land and for some special purpose gave you dominion over this land and over the red man.
That destiny is a mystery to us, for we do not understand when the buffalo are all slaughtered, the wild horses are tamed, the secret corners of the forest heavy with the scent of many men, and the view of the ripe hills blotted by talking wires.
Where is the thicket? Gone.
Where is the eagle? Gone.
The end of living and the beginning of survival.

Our planet is passing through a phase of critical transition. Humans have utilized earth's resources to reach this stage of civilization. Initially the nature of this relationship had been symbiotic. Gradually, the concept of one dimensional 'development' gripped us. It befooled our yester generations to believe that these resources are abundant. The initial symbiosis changed into a relationship of exploitation of nature by human beings. And now, we have arrived at a stage when a number of these vital resources that include sweet water will be exhausted before this century reaches its middle age if we are not conscious about conserving these from now on.

'Ecological Vision' is published with the purpose of making people aware about this crisis that our complex ecosphere faces today. It also cites instances to instil confidence in its readers that it is possible to do something in our own way to save our beautiful planet.

SERVICE CENTRE
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